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Problem Solving - Year 6

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THE MODELLING LOOP

1

READ

What must I find?



2

SORT

What information matters?



3

FORMULATE

Which operations and brackets model it?



4

ESTIMATE

What answer range makes sense?



5

SOLVE

Use an efficient strategy.



6

CHECK & EXPLAIN

Does it fit the context?
Justify your choices.





+

RELEVANT OR RED HERRING?



Read each card. Decide what information is relevant, what is extra, and what you need to find.



CARD 1 AQUARIUM EXCURSION



84 students and 9 teachers are travelling. Each bus holds 24 people. The forecast says a 30% chance of rain.



How many buses are needed?

CARD 4 LIBRARY SHELVES



The library has 936 books. Each shelf holds 18 books and is 90 cm high.



How many shelves are needed?

CARD 2 CANTEN MUFFINS



Mr. Patten baked 18 trays of muffins. The machine worked a green alarm. After 35 muffins were sold, how many were left?

CARD 5 SPORTS JERSEYS



32 jerseys cost \$28 each. The shop gives a 15% discount. Delivery takes 3 days.



What is the discounted total?

CARD 3 CHARITY RUN



Students completed 240 sponsored laps at \$1.50 per lap. There were 8 water stations.



How much money was raised?

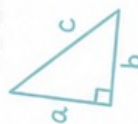
CARD 6 GARDEN SEEDLINGS



Three-quarters of 120 seedlings were planted. The flowers came in 6 colours.



How many seedlings were not planted?



=



π



RELEVANT OR RED HERRING?

SORTING & RECORDING MAT



RELEVANT

What facts will we use?



EXTRA

What facts can we ignore?



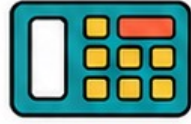
NEED TO FIND

What is the question asking?

OUR MODEL			
Expression	Estimate	Exact calculation	Context sentence

PREVIEW

STRATEGY SHOWDOWN CHALLENGE CARDS



Read, model, solve and explain. Keep units in your answer.

A

DISCO PROFIT



275 tickets sold at \$8.50 each. Venue costs were \$640. What was the profit?

B

CARTON PACKING



Pack 480 bottles in many cartons of 18. How many full cartons and how many bottles are left?

C

BATCH DISCOUNT



35 batches cost \$2.40 each. A 12.5% discount applies. What is the batch cost?

D

EMPTY SEATS



Three-fifths of 250 seats were filled, then 46 more people arrived. How many seats are empty?

E

PATH PROJECT



A 960 m path is shared equally by 8 teams. One team completes 75% of its share. How many metres remain for that team?

F

EQUIPMENT BUDGET



From a \$1,250 budget, spend \$468.75 on equipment and \$339.20 on transport. How much remains?

G

PENCIL SHARE



27 boxes hold 24 pencils each. After 15 pencils are shared the rest are shared in 9 groups. What is a fair share and remainder?

H

WATER TANK



A 1,500 L tank is 68% full. Then 125 L is used. How many litres remain?

MODEL THE SITUATION

Worksheet 1 • Page 1

Name: _____

Date: _____



Read the situation. Show a mathematical model, estimate, calculate, check and explain.

SCHOOL GARDEN MULCH

The garden team orders 14 bags of mulch at \$8.40 per bag.

The supplier gives a 10% discount on the mulch.

Delivery costs \$18.

What is the final amount the school pays?

1 	READ — What is the question asking?
2 	SORT — Circle or list the relevant information.
3 	FORMULATE — Write an equation or sequence of operations.
4 	ESTIMATE — Predict a reasonable answer.
5 	SOLVE — Show every calculation.
6 	CHECK & EXPLAIN — Is your answer reasonable? Explain using words and units.

MODEL THE SITUATION

Worksheet 1 • Page 1

Name: **ANSWERS**

Date: _____



Read the situation. Show a mathematical model, estimate, calculate, check and explain.

SCHOOL GARDEN MULCH

The garden team orders 14 bags of mulch at \$8.40 per bag.

The supplier gives a 10% discount on the mulch.

Delivery costs \$18.

What is the final amount the school pays?

1 	READ — What is the question asking? Find the final amount paid after the mulch discount and delivery.
2 	SORT — Circle or list the relevant information. 14 bags; \$8.40 each; 10% discount; \$18 delivery.
3 	FORMULATE — Write an equation or sequence of operations. $(14 \times \$8.40) - 10\% \text{ of } (14 \times \$8.40) + \$18$
4 	ESTIMATE — Predict a reasonable answer. about \$120.
5 	SOLVE — Show every calculation. $14 \times \$8.40 = \117.60 $10\% \text{ of } \$117.60 = \11.76 $\$117.60 - \$11.76 + \$18 = \123.84 Final amount: \$123.84
6 	CHECK & EXPLAIN — Is your answer reasonable? Explain using words and units. \$123.84 is reasonable: the discount lowers \$117.60, then delivery adds \$18. The answer includes dollars and cents.

MODEL THE SITUATION

Worksheet 1 • Page 2

Name: _____

Date: _____

For each problem, write a model or equation, show your working, and give a final answer with units.

A CONCERT PROFIT



A school concert sold 168 tickets at \$6.50 each. Venue and equipment costs totalled \$425. What was the concert profit?

MODEL / EQUATION:

WORKING:

FINAL ANSWER:

B EXCURSION BUSES



Seven-eighths of 320 students are attending an excursion. Twelve teachers will also attend. Each bus holds 44 people. How many buses are needed?

MODEL / EQUATION:

WORKING:

FINAL ANSWER:

C CANTEEN CUPS



The canteen began with 1,250 cups. It used 36% of them in the morning and 420 more in the afternoon. How many cups remained?

MODEL / EQUATION:

WORKING:

FINAL ANSWER:

MODEL THE SITUATION

Worksheet 1 • Page 2

Name: **ANSWERS**

Date: _____

For each problem, write a model or equation, show your working, and give a final answer with units.

A CONCERT PROFIT



A school concert sold 168 tickets at \$6.50 each. Venue and equipment costs totalled \$425. What was the concert profit?

MODEL / EQUATION:

$$(168 \times \$6.50) - \$425$$

WORKING:

$$168 \times \$6.50 = \$1,092; \$1,092 - \$425 = \$667$$

FINAL ANSWER: **\$667 profit**

B EXCURSION BUSES



Seven-eighths of 320 students are attending an excursion. Twelve teachers will also attend. Each bus holds 44 people. How many buses are needed?

MODEL / EQUATION:

$$\left(\frac{7}{8} \times 320 + 12\right) \div 44$$

WORKING:

$$\frac{7}{8} \times 320 = 280 \text{ students}; 280 + 12 = 292 \text{ people}; 292 \div 44 = 6 \text{ remainder } 28$$

FINAL ANSWER: **7 buses**

C CANTEEN CUPS



The canteen began with 1,250 cups. It used 36% of them in the morning and 420 more in the afternoon. How many cups remained?

MODEL / EQUATION:

$$1,250 - (36\% \times 1,250) - 420$$

WORKING:

$$36\% \text{ of } 1,250 = 450; 450 + 420 = 870 \text{ used}; 1,250 - 870 = 380$$

FINAL ANSWER: **380 cups**

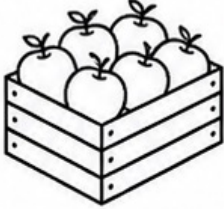
INFORMATION INVESTIGATOR

Worksheet 2 • Page 1

Name: _____

Date: _____

Underline the information you need. Cross out the red herring. Then model and solve.

1 APPLE STALL	2 SCHOOL CONCERT
 A stall receives 24 crates with 18 apples in each crate. It sells 96 apples. The crates are blue. How many apples remain?	 A concert sells 185 adult tickets at \$12 each and 74 concession tickets at \$8 each. The hall has 400 seats. What is the total ticket income?
RED HERRING:	RED HERRING:
MODEL / WORKING:	MODEL / WORKING:
ANSWER:	ANSWER:

3 RECYCLING DRIVE	4 WALKATHON
 Three classes collect 2.5 kg each. Fifteen per cent of the collection is contaminated and rejected. The event theme is green. How many kilograms are accepted?	 A student walks 18 km at an average speed of 4.5 km/h. There are 6 water stops, and the bus trip home takes 40 minutes. How long does the walk take?
RED HERRING:	RED HERRING:
MODEL / WORKING:	MODEL / WORKING:
ANSWER:	ANSWER:

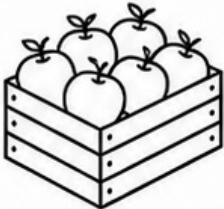
INFORMATION INVESTIGATOR

Worksheet 2 • Page 1

Name: **ANSWERS**

Date: _____

Underline the information you need. Cross out the red herring. Then model and solve.

1	APPLE STALL
	A stall receives 24 crates with 18 apples in each crate. It sells 96 apples. The crates are blue. How many apples remain?
RED HERRING: The crates are blue.	
MODEL / WORKING: $24 \times 18 = 432$ apples; $432 - 96 = 336$ apples.	
ANSWER: 336 apples	

2	SCHOOL CONCERT
	A concert sells 185 adult tickets at \$12 each and 74 concession tickets at \$8 each. The hall has 400 seats. What is the total ticket income?
RED HERRING: The hall has 400 seats.	
MODEL / WORKING: $185 \times \$12 = \$2,220$ $74 \times \$8 = \592 $\$2,220 + \$592 = \$2,812.$	
ANSWER: \$2,812	

3	RECYCLING DRIVE
	Thirty crates collect 2.5 kg each. Fifteen per cent of the collection is contaminated and rejected. The event theme is green. How many kilograms are accepted?
RED HERRING: The event theme is green.	
MODEL / WORKING: $36 \times 12.5 \text{ kg} = 450 \text{ kg};$ $15\% \text{ of } 450 \text{ kg} = 67.5 \text{ kg};$ $450 - 67.5 = 382.5 \text{ kg}.$	
ANSWER: 382.5 kg	

4	WALKATHON
	A student walks 18 km at an average speed of 4.5 km/h. There are 6 water stops, and the bus trip home takes 40 minutes. How long does the walk take?
RED HERRING: 6 water stops and the 40-minute bus trip.	
MODEL / WORKING: $18 \text{ km} \div 4.5 \text{ km/h} = 4 \text{ h}.$	
ANSWER: 4 hours	

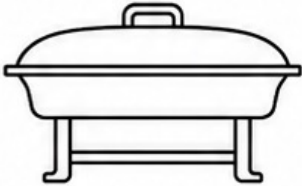
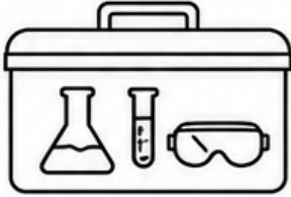
INFORMATION INVESTIGATOR

Worksheet 2 • Page 2

Name: _____

Date: _____

Decide what matters, ignore what does not, and show a complete solution.

A COMMUNITY FEAST	B SCIENCE KITS	C WALKING ROUTE
A community feast expects 360 people. Each serving tray feeds 24 people. Five musicians will perform. How many serving trays are needed?	The school orders 48 science kits at \$19.80 each. A 25% discount applies, then \$35 shipping is added. What is the final cost?	A 2.4 km route is divided into 6 equal sections. The organisers printed 500 maps. How long is each section?
		
USE: _____	USE: _____	USE: _____
IGNORE: _____	IGNORE: _____	IGNORE: _____
MODEL / WORKING: _____ _____ _____ _____ _____	MODEL / WORKING: _____ _____ _____ _____ _____	MODEL / WORKING: _____ _____ _____ _____ _____
ANSWER: _____	ANSWER: _____	ANSWER: _____

CREATE YOUR OWN RED HERRING

Write a two-step Year 6 problem with one extra fact. Swap with a partner. Can they identify the red herring and solve it?



MY PROBLEM: _____

THE RED HERRING: _____

WORKING: _____

ANSWER: _____

INFORMATION INVESTIGATOR

Worksheet 2 • Page 2

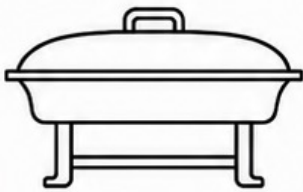
Name: **ANSWERS**

Date: _____

Decide what matters, ignore what does not, and show a complete solution.

A COMMUNITY FEAST

A community feast expects 360 people. Each serving tray feeds 24 people. Five musicians will perform. How many serving trays are needed?



USE: **360 people; 24 people per tray**

IGNORE: **Five musicians**

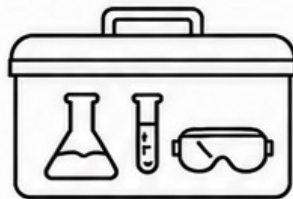
MODEL / WORKING:

$$360 \div 24 = 15$$

ANSWER: **15 serving trays**

B SCIENCE KITS

The school orders 48 science kits at \$19.80 each. A 25% discount applies, then \$35 shipping is added. What is the final cost?



USE: **48 kits; \$19.80 each; 25% discount; \$35 shipping**

IGNORE: **Nothing**

MODEL / WORKING:

$$48 \times \$19.80 = \$950.40$$
$$25\% \text{ of } \$950.40 = \$237.60$$
$$\$950.40 - \$237.60 + \$35 = \$747.80$$

ANSWER: **\$747.80**

C WALKING ROUTE

A 2.4 km route is divided into 6 equal sections. The organisers printed 500 maps. How long is each section?



USE: **2.4 km; 6 equal sections**

IGNORE: **500 maps**

MODEL / WORKING:

$$2.4 \text{ km} \div 6 = 0.4 \text{ km}$$

ANSWER: **0.4 km**

D CREATE YOUR OWN RED HERRING

Write a two-step Year 6 problem with one extra fact. Swap with a partner. Can they identify the red herring and solve it?



MY PROBLEM: **A class buys 18 packs of 25 pencils. After 37 pencils are used, how many remain? The pencils are yellow.**

THE RED HERRING: **The pencils are yellow.**

WORKING: **$18 \times 25 = 450$ pencils; $450 - 37 = 413$ pencils.**

ANSWER: **413 pencils**

MULTI-STEP MONEY MODELS

Worksheet 3 • Page 1

Name: _____

Date: _____

Choose a sequence of operations. Show each money calculation and label your final answer.

1 SPORTS EQUIPMENT



The school buys 28 cones at \$6.75 each and 12 sets of bibs at \$18.40 each. The budget is \$500. How much money remains?

PLAN / EQUATION:

CALCULATIONS:

CHECK:

FINAL ANSWER:

2 FUNDRAISING ACCOUNT



A fundraiser collects \$3,840. A payment fee of 2.5% is deducted. Then \$680 is spent on equipment. How much remains in the account?

PLAN / EQUATION:

CALCULATIONS:

CHECK:

FINAL ANSWER:

3 LIBRARY ORDER



The library orders 240 books at \$14.50 each. It receives a 15% discount, then pays \$125 freight. What is the final order cost?

PLAN / EQUATION:

CALCULATIONS:

CHECK:

FINAL ANSWER:

MULTI-STEP MONEY MODELS

Worksheet 3 • Page 1

Name: **ANSWERS**

Date: _____

Choose a sequence of operations. Show each money calculation and label your final answer.

1 SPORTS EQUIPMENT



The school buys 28 cones at \$6.75 each and 12 sets of bibs at \$18.40 each. The budget is \$500. How much money remains?

PLAN / EQUATION: $\$500 - [(28 \times \$6.75) + (12 \times \$18.40)]$

CALCULATIONS:
 $28 \times \$6.75 = \189.00
 $12 \times \$18.40 = \220.80
 $\$189.00 + \$220.80 = \$409.80$
 $\$500.00 - \$409.80 = \$90.20$

CHECK: About $\$500 - (\$196 + \$216) = \88

FINAL ANSWER: $\$90.20$ remains

2 FUNDRAISING ACCOUNT



A fundraiser collects \$3,840. A payment fee of 2.5% is deducted. Then \$680 is spent on equipment. How much remains in the account?

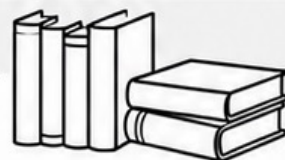
PLAN / EQUATION: $\$3,840 - (2.5\% \times \$3,840) - \$680$

CALCULATIONS:
 $2.5\% \text{ of } \$3,840 = \96
 $\$3,840 - \$96 = \$3,744$
 $\$3,744 - \$680 = \$3,064$

CHECK: $\$96 + \$680 = \$776$; $\$3,840 - \$776 = \$3,064$

FINAL ANSWER: $\$3,064$ remains

3 LIBRARY ORDER



The library orders 240 books at \$14.50 each. It receives a 15% discount, then pays \$125 freight. What is the final order cost?

PLAN / EQUATION: $(240 \times \$14.50) - 15\% + \125

CALCULATIONS:
 $240 \times \$14.50 = \$3,480$
 $15\% \text{ of } \$3,480 = \522
 $\$3,480 - \$522 = \$2,958$
 $\$2,958 + \$125 = \$3,083$

CHECK: The discounted total plus freight is less than \$3,605.

FINAL ANSWER: $\$3,083$

MULTI-STEP MONEY MODELS

Worksheet 3 • Page 2

Name: _____

Date: _____

Formulate, calculate and justify. Keep every amount to two decimal places when needed.

4 TECHNOLOGY GRANT



A club buys 96 robotics parts at \$18.75 each and pays \$860 for software.
A grant covers 25% of the total cost. How much does the school pay?

FORMULATE:

CALCULATIONS:

REASONABLENESS CHECK:

FINAL ANSWER:

5 FETE TICKETS



Three-fifths of 180 tickets are sold at \$7.50 each.
The remaining tickets are sold at \$5.20 each.
What is the total ticket income?

FORMULATE:

CALCULATIONS:

REASONABLENESS CHECK:

FINAL ANSWER:

6 LAPTOP BUDGET



The school buys 18 laptops at \$612.50 each.
An 8% discount applies, then \$420 is added for software.
From a \$12,000 budget, how much remains?

FORMULATE:

CALCULATIONS:

REASONABLENESS CHECK:

FINAL ANSWER:

MULTI-STEP MONEY MODELS

Worksheet 3 • Page 2

Name: _____ **ANSWERS**

Date: _____

Formulate, calculate and justify. Keep every amount to two decimal places when needed.

4 TECHNOLOGY GRANT



A club buys 96 robotics parts at \$18.75 each and pays \$860 for software.
A grant covers 25% of the total cost. How much does the school pay?

FORMULATE: $[(96 \times \$18.75) + \$860] \times 75\%$

CALCULATIONS:

$$96 \times \$18.75 = \$1,800$$

$$\$1,800 + \$860 = \$2,660$$

$$25\% \text{ of } \$2,660 = \$665$$

$$\$2,660 - \$665 = \$1,995$$

REASONABLENESS CHECK: The school pays 75% of \$2,660, so the answer should be \$2,000.

FINAL ANSWER: \$1,995

5 FETE TICKETS



Three-fifths of 180 tickets are sold at \$7.50 each.
The remaining tickets are sold at \$5.20 each.
What is the total ticket income?

FORMULATE: $(3/5 \times 180 \times \$7.50) + (2/5 \times 180 \times \$5.20)$

CALCULATIONS: $3/5 \text{ of } 180 = 108; 180 - 108 = 72$

$$108 \times \$7.50 = \$810$$

$$72 \times \$5.20 = \$374.40$$

$$\$810 + \$374.40 = \$1,184.40$$

REASONABLENESS CHECK: Less than $180 \times \$7.50 = \$1,350$.

FINAL ANSWER: \$1,184.40

6 LAPTOP BUDGET



The school buys 18 laptops at \$612.50 each.
An 8% discount applies, then \$420 is added for software.
From a \$12,000 budget, how much remains?

FORMULATE: $\$12,000 - [(18 \times \$612.50) - 8\% + \$420]$

CALCULATIONS: $18 \times \$612.50 = \$11,025$

$$8\% \text{ of } \$11,025 = \$882$$

$$\$11,025 - \$882 + \$420 = \$10,563$$

$$\$12,000 - \$10,563 = \$1,437$$

REASONABLENESS CHECK: The purchase total is below the \$12,000 budget.

FINAL ANSWER: \$1,437 remains

ESTIMATE, SOLVE, CHECK

Worksheet 4 • Page 1

Name: _____

Date: _____

Estimate first. Find the exact answer. Then compare and decide whether it is reasonable.

A EXCURSION TICKETS



318 tickets cost \$7.85 each. What is the total cost?

MY ESTIMATE:

WHY THIS ESTIMATE IS USEFUL:

EXACT CALCULATION:

DIFFERENCE BETWEEN ESTIMATE AND EXACT:

REASONABLENESS VERDICT:

B FOOD DONATION



Twenty-seven classes donate 48.5 kg of food each. What is the total mass?

MY ESTIMATE:

WHY THIS ESTIMATE IS USEFUL:

EXACT CALCULATION:

DIFFERENCE BETWEEN ESTIMATE AND EXACT:

REASONABLENESS VERDICT:

C WATER USE



A school used 4,760 L of water, then reduced its use by 18%.
How many litres did it use after the reduction?

MY ESTIMATE:

WHY THIS ESTIMATE IS USEFUL:

EXACT CALCULATION:

DIFFERENCE BETWEEN ESTIMATE AND EXACT:

REASONABLENESS VERDICT:

ESTIMATE, SOLVE, CHECK

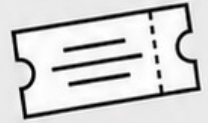
Worksheet 4 • Page 1

Name: **ANSWERS**

Date: _____

Estimate first. Find the exact answer. Then compare and decide whether it is reasonable.

A EXCURSION TICKETS



318 tickets cost \$7.85 each. What is the total cost?

MY ESTIMATE:	$300 \times \$8 = \$2,400$
WHY THIS ESTIMATE IS USEFUL:	Both factors are close and easy to multiply mentally.
EXACT CALCULATION:	$318 \times \$7.85 = \$2,496.30$
DIFFERENCE BETWEEN ESTIMATE AND EXACT:	$\$2,496.30 - \$2,400 = \$96.30$
REASONABLENESS VERDICT:	Reasonable — the exact result is close to \$2,400.

B FOOD DONATION



Twenty-seven classes donate 48.5 kg of food each. What is the total mass?

MY ESTIMATE:	$30 \times 50 \text{ kg} = 1,500 \text{ kg}$
WHY THIS ESTIMATE IS USEFUL:	30 is close to 27 and 48.5 is close to 50.
EXACT CALCULATION:	$27 \times 48.5 \text{ kg} = 1,309.5 \text{ kg}$
DIFFERENCE BETWEEN ESTIMATE AND EXACT:	$1,500 - 1,309.5 = 190.5 \text{ kg}$
REASONABLENESS VERDICT:	Reasonable — rounding both factors up made the estimate higher.

C WATER USE



A school used 4,760 L of water, then reduced its use by 18%. How many litres did it use after the reduction?

MY ESTIMATE:	$4,800 \text{ L} \times 80\% = 3,840 \text{ L}$
WHY THIS ESTIMATE IS USEFUL:	4,760 is close to 4,800 and 82% is close to 80%.
EXACT CALCULATION:	18% of 4,760 L = 856.8 L; $4,760 - 856.8 = 3,903.2 \text{ L}$
DIFFERENCE BETWEEN ESTIMATE AND EXACT:	$3,903.2 - 3,840 = 63.2 \text{ L}$
REASONABLENESS VERDICT:	Reasonable — the exact result is just above the estimate.

Name: _____

Date: _____

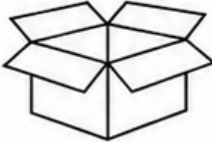
Calculate, then interpret the answer in context. A remainder may change what you report.

D BOOKLET BOXES The school packs 1,045 booklets into boxes that hold 32 each. How many boxes are needed, and how many booklets are in the final box? 	ESTIMATE: CALCULATION: QUOTIENT / REMAINDER: CONTEXT ANSWER: CHECK:
E SPORTS TEAMS The school divides 845 students into 18 teams as evenly as possible. How many students are in each team? 	ESTIMATE: CALCULATION: QUOTIENT / REMAINDER: CONTEXT ANSWER: CHECK:
F PAINT COVERAGE The school has 62.5 litres of paint. Each litre covers 4 m². What area can be painted? 	ESTIMATE: CALCULATION: QUOTIENT / REMAINDER: (write N/A if it does not apply.) CONTEXT ANSWER: CHECK:
G GIFT CARDS A \$2,750 prize fund is shared as equal whole-dollar gift cards among 12 students. What value can each card have, and how much money is left? 	ESTIMATE: CALCULATION: QUOTIENT / REMAINDER: CONTEXT ANSWER: CHECK:

Name: **ANSWERS**

Date: _____

Calculate, then interpret the answer in context. A remainder may change what you report.

D BOOKLET BOXES The school packs 1,045 booklets into boxes that hold 32 each. How many boxes are needed, and how many booklets are in the final box? 	ESTIMATE: A little more than 32 boxes CALCULATION: $1,045 \div 32 = 32$ remainder 21 QUOTIENT / REMAINDER: 32 R 21 CONTEXT ANSWER: 33 boxes are needed; the final box holds 21 booklets. CHECK: $32 \times 32 + 21 = 1,045$
E SPORTS TEAMS The school divides 845 students into 18 teams as evenly as possible. How many students are in each team? 	ESTIMATE: $900 \div 18 = 50$ students per team CALCULATION: $845 \div 18 = 46$ remainder 17 QUOTIENT / REMAINDER: 46 R 17 CONTEXT ANSWER: 17 teams have 46 students and 1 team has 46 students. CHECK: $17 \times 47 + 46 = 845$
F PAINT COVERAGE The school has 62.5 m² of wall. Each litre covers 0.4 m². What area can be painted? 	ESTIMATE: $60 \times 8.5 \text{ m}^2 = 510 \text{ m}^2$ CALCULATION: $62.5 \times 8.4 = 525$ QUOTIENT / REMAINDER: N/A CONTEXT ANSWER: 525 m² can be painted. CHECK: $62.5 \times 8 + 62.5 \times 0.4 = 500 + 25 = 525$
G GIFT CARDS A \$2,750 prize fund is shared as equal whole-dollar gift cards among 12 students. What value can each card have, and how much money is left? 	ESTIMATE: $\\$2,760 \div 12 = \\230 CALCULATION: $\\$2,750 \div 12 = \\229 remainder \$2 QUOTIENT / REMAINDER: \$229 R \$2 CONTEXT ANSWER: Each card can be \$229; \$2 is left. CHECK: $12 \times \\$229 + \\$2 = \\$2,750$

Name: _____

Date: _____

Solve the same problem in two valid ways. Compare the methods and defend your conclusion.



SCHOOL HOODIE ORDER

The school orders 72 hoodies at \$31.50 each.
A 20% discount applies to the hoodie cost,
then \$96 delivery is added.



What is the final amount paid?



1 ESTIMATE

Write a sensible estimate
and explain your rounding.



2 METHOD A – FIND AND
SUBTRACT THE DISCOUNT

Show each calculation.



3 METHOD B – USE THE
PERCENTAGE

Show each calculation.



4 COMPARE

How do both methods
represent the same
situation?



5 CHECK

Use an inverse operation,
a second calculation or
the estimate.



6 CONCLUSION

State the final amount
with units and justify
why it is reasonable.

Name: ANSWERS

Date: _____

Solve the same problem in two valid ways. Compare the methods and defend your conclusion.



SCHOOL HOODIE ORDER

The school orders 72 hoodies at \$31.50 each.
A 20% discount applies to the hoodie cost,
then \$96 delivery is added.



What is the final amount paid?

 1 ESTIMATE Write a sensible estimate and explain your rounding.	$70 \times \\$32 = \\$2,240$; 80% is about \$1,792 add about \$100 delivery → about \$1,900
 2 METHOD A – FIND AND SUBTRACT THE DISCOUNT Show each calculation.	$72 \times \\$31.50 = \\$2,268$ $20\% \text{ of } \\$2,268 = \\453.60 $\\$2,268 - \\$453.60 = \\$1,814.40$ $\\$1,814.40 + \\$96 = \\$1,910.40$
 3 METHOD B – USE THE PERCENTAGE Show each calculation.	$100\% - 20\% = 80\%$ $80\% \text{ of } \\$2,268 = \\$1,814.40$ $\\$1,814.40 + \\$96 = \\$1,910.40$
 4 COMPARE How do both methods represent the same situation?	Subtracting the 20% discount leaves 80% of the hoodie cost, so both methods model the same amount.
 5 CHECK Use an inverse operation, a second calculation or the estimate.	$\\$1,910.40 - \\$96 = \\$1,814.40$ $\\$1,814.40 \div 80\% = \\$2,268$ $\\$2,268 \div 72 = \\31.50
 6 CONCLUSION State the final amount with units and justify why it is reasonable.	The final amount is \$1,910.40. Both methods agree, and the result is close to the \$1,900 estimate.

Name: _____

Date: _____

Build a complete mathematical model. Show how each value contributes to your conclusion.



YEAR 6 CAMP BUDGET

The camp budget is \$9,500 for 48 students.

- Accommodation costs \$128 per student.
- Meals cost \$22.50 per student.
- The bus costs \$1,850 in total.

A fundraiser covers 18% of the total camp cost.

How much must the school pay, and how much of the budget remains?



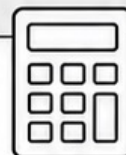
1 FORMULATE

Write one expression or a clear sequence of operations.

2 ITEMISED COSTS

Accommodation	$48 \times \$128$	TOTAL: _____
Meals	$48 \times \$22.50$	TOTAL: _____
Bus	fixed cost	TOTAL: _____

3 TOTAL CAMP COST



4 FUNDRAISER CONTRIBUTION — 18%



5 SCHOOL PAYMENT AND BUDGET REMAINING



6 JUSTIFY

Is the camp within budget?

How do your estimate and calculations support your answer?

What assumptions did you make?



Name: **ANSWERS**

Date: _____

Build a complete mathematical model. Show how each value contributes to your conclusion.



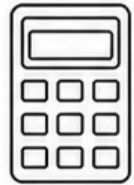
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A fundraiser covers 18% of the total camp cost.

How much must the school pay, and how much of the budget remains?



1 FORMULATE

Write one expression or a clear sequence of operations.

$$\text{Total} = (48 \times \$128) + (48 \times \$22.50) + \$1,850$$

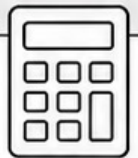
School pays 82% of the total; budget remaining = \$9,500 – school payment.

2 ITEMISED COSTS

Accommodation	$48 \times \$128$	TOTAL: <u>\$6,144</u>
Meals	$48 \times \$22.50$	TOTAL: <u>\$1,080</u>
Bus	fixed cost	TOTAL: <u>\$1,850</u>

3 TOTAL CAMP COST

$$\$6,144 + \$1,080 + \$1,850 = \$9,074$$



4 FUNDRAISER CONTRIBUTION — 18%

$$18\% \text{ of } \$9,074 = 0.18 \times \$9,074 = \$1,633.32$$



5 SCHOOL PAYMENT AND BUDGET REMAINING

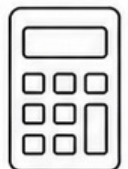


School pays:

$$\$9,074 - \$1,633.32 = \$7,440.68$$

Budget remaining:

$$\$9,500 - \$7,440.68 = \$2,059.32$$



6 JUSTIFY

Is the camp within budget?

Yes, the camp is within budget after the fundraiser.

How do your estimate and calculations support your answer?

The school pays \$7,440.68, which is about 82% of \$9,074 and leaves \$2,059.32.

What assumptions did you make?

Assumptions: all 48 students attend; listed costs are complete; the 18% applies to the full camp cost.



COMMUNITY MARKET CHALLENGE

Assessment • Page 1 of 2

Name: _____

Date: _____

Mathematical modelling with rational numbers, percentages and financial contexts • AC9M6N09



PLAN THE COSTS

A Year 6 class plans a reusable drink-bottle stall.

- It orders 250 bottles at \$6.40 each.
- The supplier gives a 12.5% discount on the bottle cost.
- The stall fee is \$185.
- Signs cost \$74.50.



Calculate the total cost of preparing the stall.

Show a complete model and justify that your answer is reasonable.

1



READ AND SORT

What is the question asking? List the relevant values and units.

2



FORMULATE

Write one expression or a clear sequence of operations.

3



ESTIMATE

Predict a reasonable total and explain your reasoning.

4



CALCULATE

Work out every step, including the discount.

5



CHECK

Use another method, an inverse operation or your estimate.

6



COMMUNICATE

State the total cost in a complete sentence with dollars and cents.

Page 1 score: _____ / 15

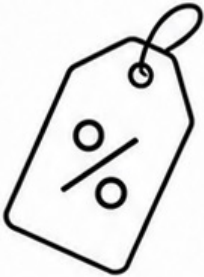
COMMUNITY MARKET CHALLENGE

Assessment • Page 1 of 2

Name: **ANSWERS**

Date: _____

Mathematical modelling with rational numbers, percentages and financial contexts • AC9M6N09

PLAN THE COSTS	
	A Year 6 class plans a reusable drink-bottle stall. • It orders 250 bottles at \$6.40 each. • The supplier gives a 12.5% discount on the bottle cost. • The stall fee is \$185. • Signs cost \$74.50. 
Calculate the total cost of preparing the stall. Show a complete model and justify that your answer is reasonable.	
1 	READ AND SORT What is the question asking? List the relevant values and units. Find the total preparation cost. Relevant values: 250 bottles, \$6.40 each, 12.5% discount, \$185 stall fee and \$74.50 signs.
2 	FORMULATE Write one expression or a clear sequence of operations. $(250 \times \\$6.40) - 12.5\%$ $(250 \times \\$6.40) - \\$185 + \\$74.50$
3 	ESTIMATE Predict a reasonable total and explain your reasoning. Bottle cost \$1,600, discount about \$200; fees about \$260 → about \$1,660.
4 	CALCULATE Show every step, including the discount. $250 \times \\$6.40 = \\$1,600$ $12.5\% \text{ of } \\$1,600 = \\200 $\\$1,600 - \\$200 = \\$1,400$ $\\$1,400 + \\$185 + \\$74.50 = \\$1,659.50$
5 	CHECK Use another method, an inverse operation or your estimate. $\\$185 + \\$74.50 = \\$259.50$ $\\$1,600 - \\$200 + \\$259.50 = \\$1,659.50$, close to the \$1,660 estimate.
6 	COMMUNICATE State the total cost in a complete sentence with dollars and cents. The total cost of preparing the stall is \$1,659.50.

COMMUNITY MARKET CHALLENGE

Assessment • Page 2 of 2

Name: _____

Date: _____

Mathematical modelling with rational numbers, percentages and financial contexts • AC9M6N09

MODEL SALES, PROFIT AND DONATION

Use the preparation cost from Page 1: \$1,659.50.

- At the market, 84% of the 250 bottles are sold for \$11.20 each.
- The remaining bottles are sold to a community centre for \$7.50 each.
- The class donates 25% of its profit to charity.

Calculate the total revenue, profit, charity donation and profit remaining.

Round money to the nearest cent when needed.

1



BOTTLES SOLD AT EACH PRICE

Find 84% of 250
and the number remaining.

2



TOTAL REVENUE

Show both sales amounts
and add them.

3



PROFIT

Use revenue and the
Page 1 preparation cost.

4



CHARITY DONATION 25%

Calculate and round to
the nearest cent if needed.

5



PROFIT REMAINING

Show a complete
calculation.

6



JUSTIFY AND COMMUNICATE

Does your answer make sense
compared with the revenue
and costs?

How did you handle rounding?

State the final donation and
remaining profit in
complete sentences.

Page 2 score: _____ / 15

Total assessment score: _____ / 30

COMMUNITY MARKET CHALLENGE

Assessment • Page 2 of 2

Name: _____ **ANSWERS**

Date: _____

Mathematical modelling with rational numbers, percentages and financial contexts • AC9M6N09

MODEL SALES, PROFIT AND DONATION

Use the preparation cost from Page 1: \$1,659.50.

- At the market, 84% of the 250 bottles are sold for \$11.20 each.
- The remaining bottles are sold to a community centre for \$7.50 each.
- The class donates 25% of its profit to charity.

Calculate the total revenue, profit, charity donation and profit remaining.

Round money to the nearest cent when needed.

1 	BOTTLES SOLD AT EACH PRICE Find 84% of 250 and the number remaining.	$84\% \text{ of } 250 = 0.84 \times 250 = 210 \text{ bottles}$ $250 - 210 = 40 \text{ bottles remaining}$
2 	TOTAL REVENUE Show both sales amounts and add them.	$210 \times \$11.20 = \$2,352$ $40 \times \$7.50 = \300 $\$2,352 + \$300 = \$2,652$
3 	PROFIT Use revenue and the Page 1 preparation cost.	$\$2,652 - \$1,659.50 = \$992.50 \text{ profit}$
4 	CHARITY DONATION Calculate and round to the nearest cent if needed.	$25\% \text{ of } \$992.50 = \248.125 Rounded to the nearest cent: $\$248.13$
5 	PROFIT REMAINING Show a complete calculation.	$\$992.50 - \$248.13 = \$744.37$
6 	JUSTIFY AND COMMUNICATE Does your answer make sense compared with the revenue and costs? How did you handle rounding? State the final donation and remaining profit in complete sentences.	The profit is less than the \$2,652 revenue because the \$1,659.50 preparation cost was subtracted. The exact donation was \$248.125, so the third decimal of 5 rounds the cents up. The class donates \$248.13 to charity and has \$744.37 profit remaining.

PROBLEM SOLVING — YEAR 6 RUBRIC

Community Market Challenge •

Student: _____

Date: _____

Teacher: _____

CRITERIA	BEGINNING • 1	DEVELOPING • 2	ACHIEVING • 3	CONFIDENT • 4	EXCEEDING • 5
FORMULATES THE MODEL	Needs support to identify the question and useful information.	Identifies some relevant information; the model is incomplete.	Identifies relevant information and builds a suitable model.	Selects an efficient model and states key assumptions.	Creates a flexible model and clearly explains every choice.
SELECTS OPERATIONS AND STRATEGIES	Chooses operations that do not yet match the situation.	Chooses some suitable operations; needs prompting.	Chooses suitable operations and completes a logical sequence.	Uses efficient strategies and compares valid approaches.	Adapts strategies insightfully and justifies the most efficient approach.
CALCULATES ACCURATELY	Calculations contain frequent errors or missing units.	Some calculations are accurate; errors affect the result.	Calculations, money and units are accurate.	Accurate work is organised and rounded appropriately.	Accuracy is sustained across complex steps and representations.
CHECKS AND INTERPRETS	Gives an answer without checking or interpreting it.	Attempts a check or brief interpretation with support.	Checks reasonableness and interprets the answer in context.	Uses a convincing independent check and explains limitations.	Evaluates assumptions, rounding and model limitations critically.
COMMUNICATES AND JUSTIFIES	Explanation is unclear or incomplete.	Gives a partial explanation using some mathematical language.	Communicates a clear answer and sound justification.	Links evidence, units and decisions in a persuasive explanation.	Communicates precise reasoning and defends conclusions comprehensively.

TOTAL: _____ / 25

Achievement guide: 5–9 Beginning 10–14 Developing 15–18 Achieving 19–22 Confident 23–25 Exceeding

Teacher feedback: _____

Problem Solving



Learning Intervention

We are learning to formulate, solve, interpret and justify practical mathematical models.

Success: select relevant facts • choose operations • estimate • check • explain.



Launch: The School Fair

A school fair sells 240 tickets at \$50. Costs are \$890. A sponsor covers 15% of the costs.

What could we find? What do you notice? Which information matters?



A Problem Becomes a Model

CONTEXT → RELEVANT INFORMATION → EXPRESSION → SOLUTION

INTERPRETATION

A model turns a real situation into mathematics, then returns the answer to the situation.



Step 1: Read for the Question

Underline the exact question. Note the quantity and unit you must report.

Ask: What would a complete-sentence answer look like?



Step 2: Sort the Information

RELEVANT: needed to answer • EXCESS: too much information • MISUSED: information that is not needed
must be ignored or assumed

Do not force every number into the calculation.



Step 3: Formulate the Model

Choose operations that match the relationship. Use brackets to preserve the situation's order.

Example: $(\text{tickets} \times \text{price}) - \text{costs}$



Step 4: Estimate First

Round to friendly numbers and predict a possible range.

An estimate is an error detector—not the final answer.



Step 5: Solve Efficiently

Choose an efficient mental, written or digital strategy. Keep units
designed for working.

Record enough steps so another person can follow the model.



Step 6: Interpret and Check

Compare with the estimate. Check units, constraints and reasonableness.

Then write what the number means in the original context.



Communicate and Justify

State the operations and why they fit. Explain assumptions and reasoning.

Finish with a clear conclusion that answers the question.



Relevant or Red Herring?

A camp has 148 students, 12 teachers, buses cost \$52, and rain is forecast. How many buses?

Use $148 + 12 = 160$ the forecast is extra. $160 \div 52$ means 4 buses are needed.



Use Brackets for Order

A club sells 168 tickets at \$6.50 and pays \$425 in costs.

Model: $(168 \times 6.50) - 425 = 1,092 - 425 = \667 . Brackets keep the revenue together.



Discount and Delivery

32 jerseys cost \$28.50 each with 15% off, plus \$24 delivery.

Item cost: \$912 • discount: \$136.80 • final cost: \$775.20



Compare Valid Strategies

20% off 18 kits at \$42 when \$30 delivery.

$$(18 \times 42) \times 0.80 + 30 \text{ OR } 18 \times (42 \times 0.80) + 30$$

Both give \$634.80 because the discount applies before delivery.



Interpret Remainders

1,045 booklets packed in boxes of 32 gives remainder 21.

For packaging, round up. For sharing, report the

remainder to rebalance the groups.



Guided Practice: Excursion

96 students: tickets cost \$18.75 each, bus cost \$860, and a grant pays 25% of the combined cost.

Formulate • estimate • solve • interpret • justify. What does the school pay?

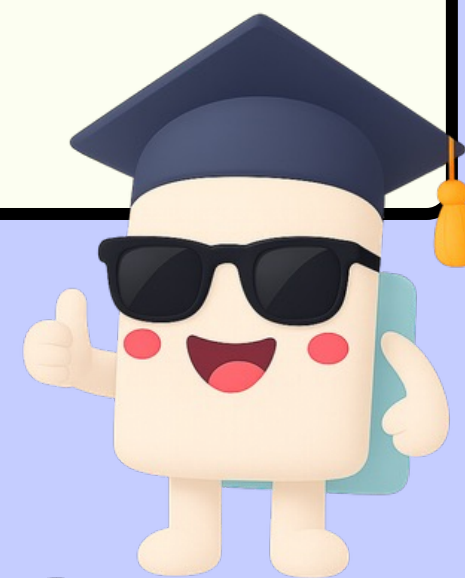
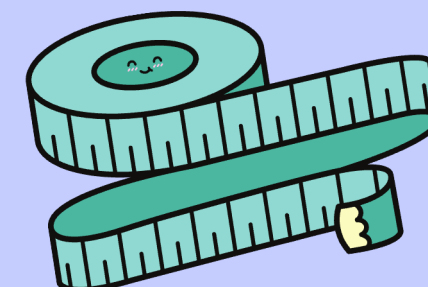
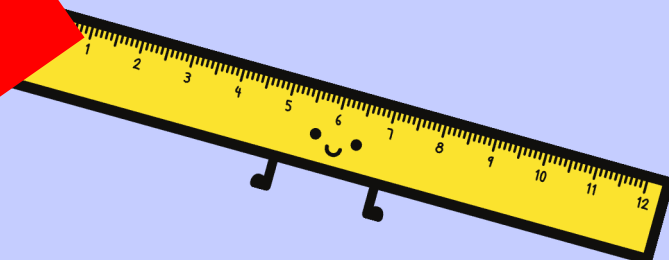
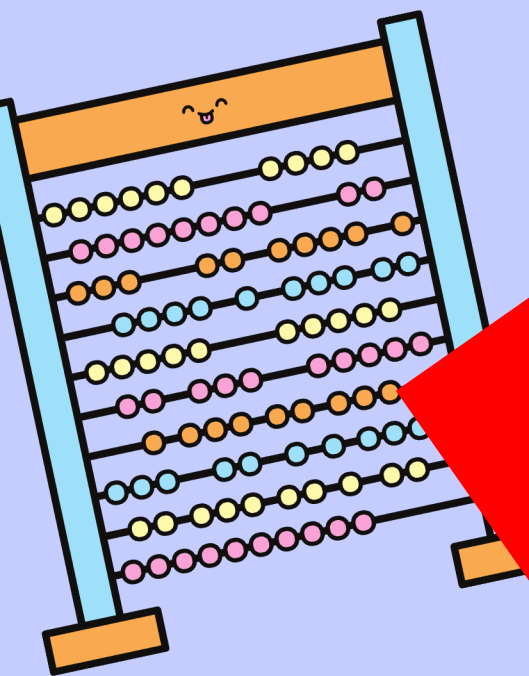
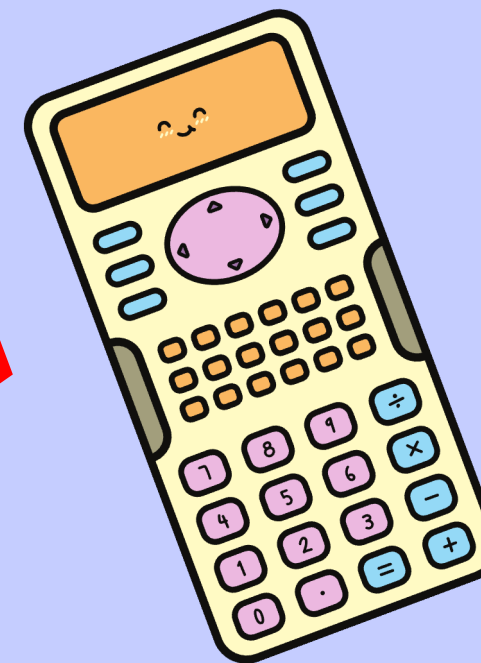
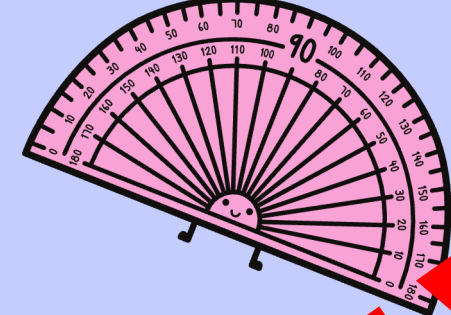
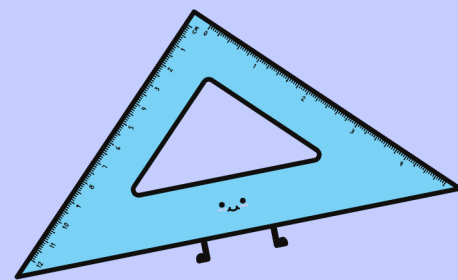
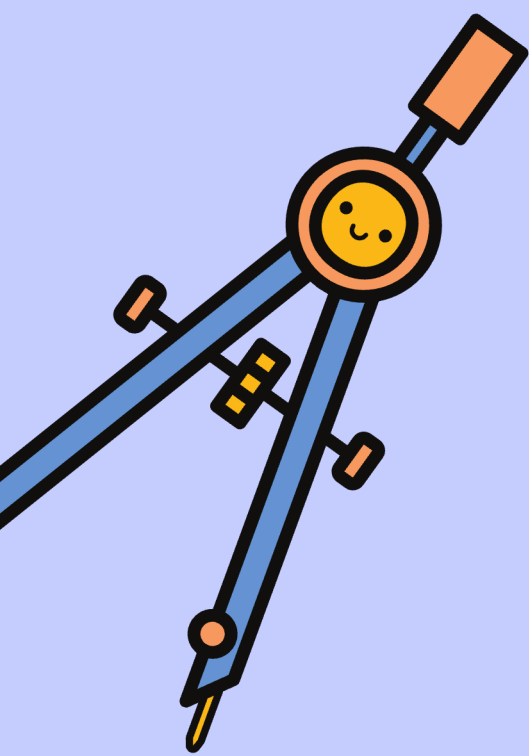


Independent Challenge

Design a model for a real class event using at least three quantities and two operations.

Exchange models, estimate, solve, check, then suggest one
via peer-reviewed improvement.





Model. Check. Explain.

Problem Solving Quiz



Question 1 • Multiple Choice

148 students and 12 teachers travel on a bus that seat 52. The forecast is 2°C.

Which fact is irrelevant? A 148 students B 12 teachers C 52 seats
D 2°C forecast



Answer 1

D • The 22°C weather forecast is irrelevant.

The passenger total and bus capacity determine how many buses are needed.



Question 2 · True or False

$(14 \times \$8.40) \times 0.90 + \18 model four men's shirts with a 10%

on our

followed by an \$18 delivery charge.



Answer 2

TRUE • The 10% discount applies to the unit cost first.
The fixed delivery charge is added after the discount.



Question 3 • Short Answer

A club sells 168 tickets at \$6.50 each and pays \$425 in costs.

Write an expression and calculate the amount remaining.



Answer 3

$$(168 \times 6.50) - 425 = 1092 - 425 = 667$$

The club has \$667 remaining after costs.



Question 4 • Multiple Choice

32 jerseys cost \$28.50 each. A 15% discount is applied. What is the discounted cost?

A \$136.80 B \$773.20 C \$83.50 D \$1,048.80



Answer 4

$$B = \$775.20$$

$$32 \times \$28.50 = \$912, \text{ then } \$912 \times 0.85 = \$775.20.$$



Question 5 • True or False

1,045 booklets packed into boxes of 32 each. Only 32 boxes.



Answer 5

FALSE • $1,045 \div 32 = 32$ remainder 21.

A thirty-third box is needed for the remaining 21 booklets.



Question 6 • Short Answer

Give a sensible estimate for the revenue from 18 tickets sold at \$7.5 each.

Show the friendly numbers you used.



Answer 6

About \$2,400, using 300×8

Other close estimates are acceptable when the rounding is explained.



Question 7 • Multiple Choice

Tickets cost $96 \times \$18.75$ and buses cost \$860. Grant pays 25% of the combined cost.

Which models the school's share?

- A $(96 \times 18.75) + 860 \times 75$ B $((96 \times 18.75) + 860) \times .75$ C $(96 \times 18.75) + (860 \times .25)$ D $((96 \times 18.75) + 860) \times .25$



Answer 7

$$B \cdot ((96 \times 18.75) + 860 \times 0.75)$$

The costs are combined first, and a school then pays the remaining 75%.



Question 8 • True or False

Every number in a practical problem must appear in the calculation.



Answer 8

FALSE • Include only the information needed to answer the question

Extra information can be true without being relevant.



Question 9 • Multiple Choice

20% off 18 kits at \$42, then \$30 delivery. Which strategy is valid?

A $(18 \times 42) \times .80 + 30$ B $18 \times (42 \times .80) + 30$

C both strategies D neither strategy



Answer d

C • Both strategies are valid and both cost \$634.80.
Each discounts the item's cost before adding delivery.



Question 10 • Short Answer

845 items are shared as evenly as possible among 18 groups.
Interpret the quotient and remainder, then describe a balanced arrangement.

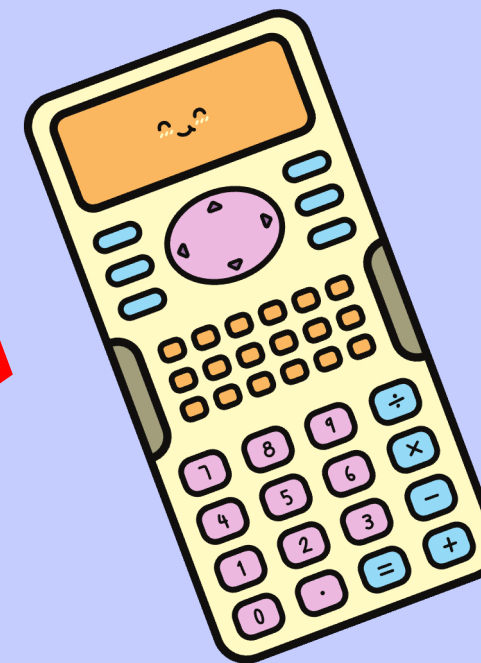
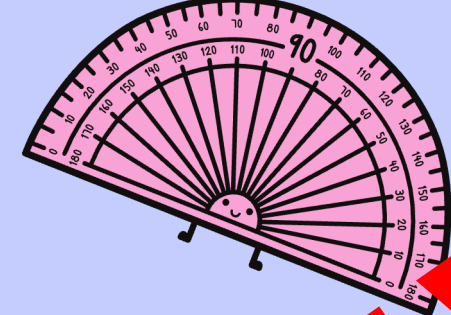
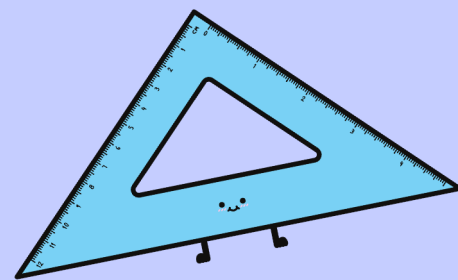
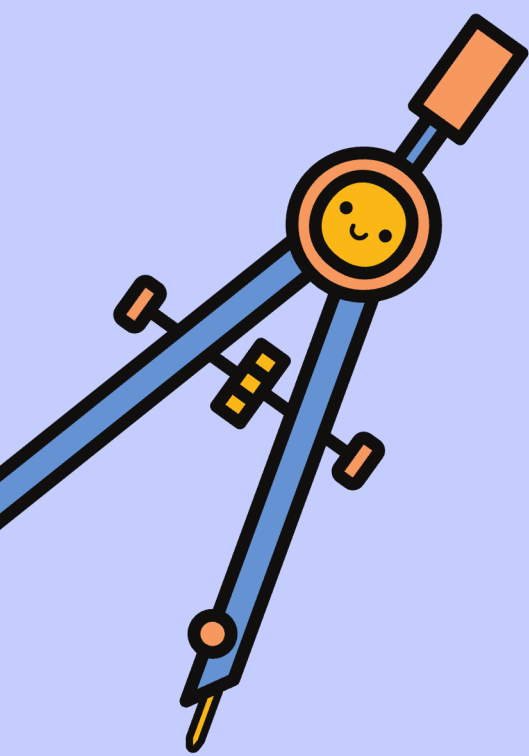


Answer 10

$$845 \div 18 = 46 \text{ remainder } 17$$

A balanced arrangement is sixteen groups of 47 and one group of 46.





**Model. Check.
Explain.**

