



Year 10 Mathematics Practice Exam #1

Time: 2 hours
Sections

Topic	Page	Result
Number Base skills: percentages; fractions; decimals; ratios; proportional thinking Higher level: multiple step problems; percentage change; standard form	2	
Algebra Base skills: simplifying; expanding and factorising, including quadratics; solving linear Higher level: solving with fractions and quadratics; writing equations in context; roots of terms	5	
Graphs Base skills: reading graphs in a context; plotting lines; using rules for patterns Higher level: equations of lines; plot a parabola; finding rules for patterns	8	
Measurement Base skills: perimeters and areas of triangles, quadrilaterals and circles; unit conversions Higher level: shapes composed of fractional or multiple simple shapes; rates; volumes; time	10	
Trigonometry Base skills: Pythagoras; finding a side using Trig Higher level: multiple step problems; situations without right angle given at the start	13	
Overall Grade		

It is expected that working is shown for all questions.

Number

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Achieved	Merit	Excellence
□	□	□

QUESTION ONE

Write the following from smallest to biggest.

a) 6.42 6.5 $\frac{32}{5}$ 68%

_____ < _____ < _____ < _____

b) -4 -5 -4.6 $-5\frac{1}{2}$

_____ < _____ < _____ < _____

QUESTION TWO

Eagle Transport split their profits between the owners and the workers in the ratio of 5 : 12 (O : W).

a) If workers get \$180,000 how much do the owners get?

b) If the profits are a total of \$416,000 how should it be split?

QUESTION THREE

Eagle Transport made a **loss** of \$31,000 in 2017 and a **profit** of \$416,000 in 2018.

How much more did they make in 2018 than in 2017?

QUESTION FOUR

27% of Eagle Transports' items go by sea.

If they move 43,500 items in a year, how many go by sea?

QUESTION FIVE

5,200 of the 43,500 items moved went by air.

What percentage went by air?

QUESTION SIX

Eagle Transport moved 43,500 items in 2018.

a) They expect to move 4% more in 2019. How many items do they expect to ship in 2019?

b) If the 2018 total of 43,500 items was a **decrease** of 3% from 2017, how many did they move in 2017?

QUESTION SEVEN

Eagle Transport have taken out a loan to help expand. It is for \$250,000 and they have to pay it back at 5% per year compounding (so where interest is paid on previous interest).

If they pay none of it back for 8 years, how much will they end up owing?

QUESTION EIGHT

The ratio of national to international freight was 7 : 2, but after a cheaper international airline was used it changed to 8 : 3.

The amount of national freight remained the same after the change. How much had the international freight increased by, as a %?

QUESTION NINE

A large parcel costs \$12.50 to ship from Auckland to Christchurch overnight.

a) A frequent user has a 12% discount. How much would it cost them to ship from Auckland to Christchurch?

b) If the price goes up to \$13, from \$12.50, what is that as a percentage increase?

QUESTION TEN

Eagle Transport have 34 trucks.

The trucks are used 74% of the day.

They estimate that they cannot use them at more than 80% of the day (to allow for maintenance etc).

If business increases by a fifth, what is the minimum number of extra trucks they need?

QUESTION ELEVEN

a) Drivers are paid \$22 per hour.

If they work more than 40 hours in a week, the pay increases by 50% ("time and a half").

How many hours must a driver work to earn over \$1,000 in a week?

b) What percentage would the pay rate have to be increased by so that drivers earned \$1,000 in a normal 40 hour week?

QUESTION TWELVE

Eagle Transport is organising their Christmas function. The costs involved are:

- Hire of the venue is \$2,000
- Security, waiters, and cleaning staff is \$1,500
- Decorations have been ordered from Australia. They cost AU\$400. (1 AUD = 1.08 NZD)
- The DJ is \$80 an hour for three hours, plus GST of 15%
- Cost of dinner is \$30 per person

A survey indicates that about three-fifths of the 162 staff will attend the function, and 65% of those will also buy a ticket for a partner who doesn't work for Eagle.

How much should each ticket cost if the function is to not make a loss?

QUESTION THIRTEEN

Eagle Air are buying another plane.



There is a Bombardier Q200 (second hand) on sale for \$5.8 Million US Dollars.

They think they can get it for less 8% if they pay cash up front.

The exchange rate at the moment in to NZ dollars is 1NZD = 0.63 USD.

They want the plane to pay for itself over five years (that is earn its cost back).

How much a month will it need to increase profits to do that?

Algebra

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QUESTION ONE

Simplify the following expressions:

- a) $e + e + e + e =$ _____
- b) $h \times 4 =$ _____
- c) $2x - 7xy + 7x + 5xy =$ _____
- d) $3 \times p \times p =$ _____
- e) $5x^3 \times 4x^2y =$ _____

QUESTION TWO

Using n as the unknown, write algebraic expressions for:

- a) Six is taken away from eight times a number.

- b) Two is added to a number, and the result is then multiplied by four.

QUESTION THREE

Calculate the following expressions if $a = 4$, $b = 5$ and $c = -3$

- a) $2ab =$ _____
- b) $a^2 - c =$ _____

QUESTION FOUR

Solve these equations. Show your working.

- a) $x - 12 = 4$

- b) $5x + 11 = 2$

- c) $21 = 3(x - 5)$

- d) $2x + 24 = 6x + 13$

- e) $\frac{2x + 8}{x - 5} = 4$

QUESTION FIVE

Write **equations** for these situations, then solve them. Show all working.

- a) Chan and Harnesh share a packet of 22 biscuits.

If Harnesh gets eight more than Chan, how many does Chan get?

- b) Bob runs the same distance each day. After thirty days he is 25 km short of his 400 km goal. How far does he run each day?

- c) Malcolm adds 6 to a number and divides the result by two. He finds that gives the same result as adding 16 to the number and dividing by seven. What is Malcolm's starting number?

QUESTION SIX

Justin pays a tithe to his church. He pays 10% on anything he earns over \$40,000.

The formula he uses is :

$$T = 0.1(E - 40,000)$$

where T is the tithe he pays and E is how much he earns

- a) Justin earns \$85,000 in 2018. How much does he pay as tithe?

- b) If Justin pays \$4,800 in tithe in 2019, how much did he earn?

- c) Write a formula that gives how much Justin earned, E, in terms of how much tithe he paid, T.

QUESTION SEVEN

Expand, and simplify if appropriate

- a) $3(x - 5) =$ _____

- b) $x(2y + 4) =$ _____

- c) $5x(x + 3) =$ _____

- d) $4(x + 6) + 2(x - 10) =$ _____

- e) $(x + 2)(x + 10) =$ _____

QUESTION EIGHT

Factorise fully

- a) $10x + 20 =$ _____

- b) $x^2 + 4x =$ _____

- c) $10x + 2x^2 =$ _____

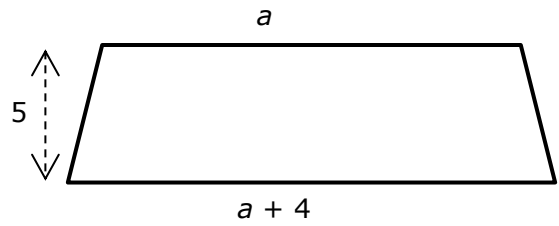
- d) $x^2 + 8x + 15 =$ _____

- e) $x^2 - 12x - 13 =$ _____

QUESTION NINE

A trapezium is 4 cm wider along the bottom parallel side to the top parallel side.

It has a height of 5.



- a) Write a simplified expression for the area of the trapezium in terms of a , the top side length.

$$\text{Area of Trapezium} = \frac{a + b}{2} h$$

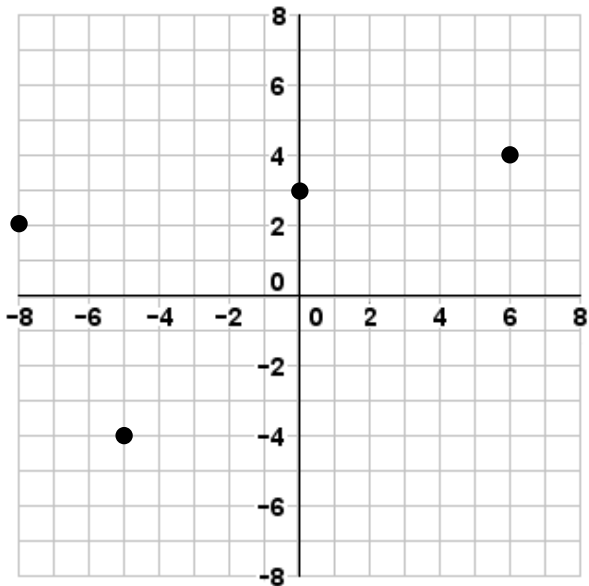
- b) If the area of the trapezium is 60, how long is the top side?
(You must solve an equation.)

Patterns and Graphs

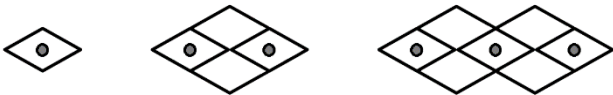
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QUESTION ONE

Write the co-ordinates of each point beside it:



QUESTION TWO

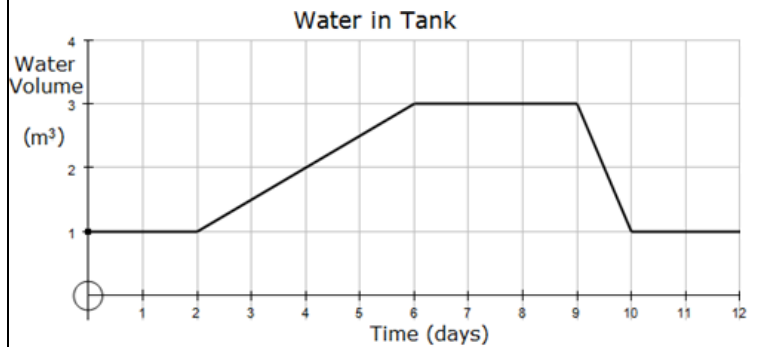


spots	diamonds
1	1
2	4
3	7
4	

- a) Complete the table above:
 b) If the pattern continues, how many diamonds would go with 12 spots?

- b) Write a rule linking the number of spots, S, to the number of diamonds, D.

QUESTION THREE



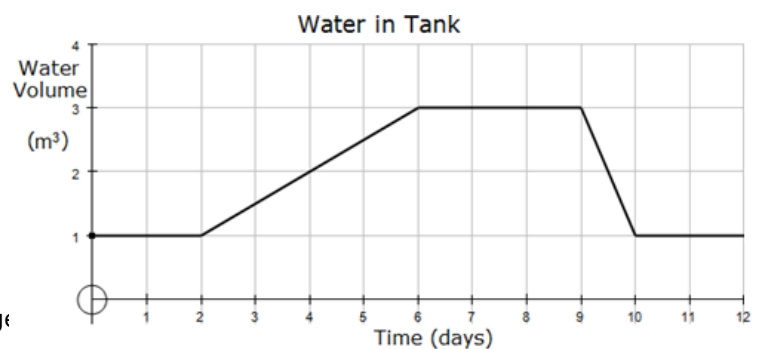
The graph shows the amount of water in a rain water tank over some days.

- a) The tank fills when it rains. How many days did it rain for?

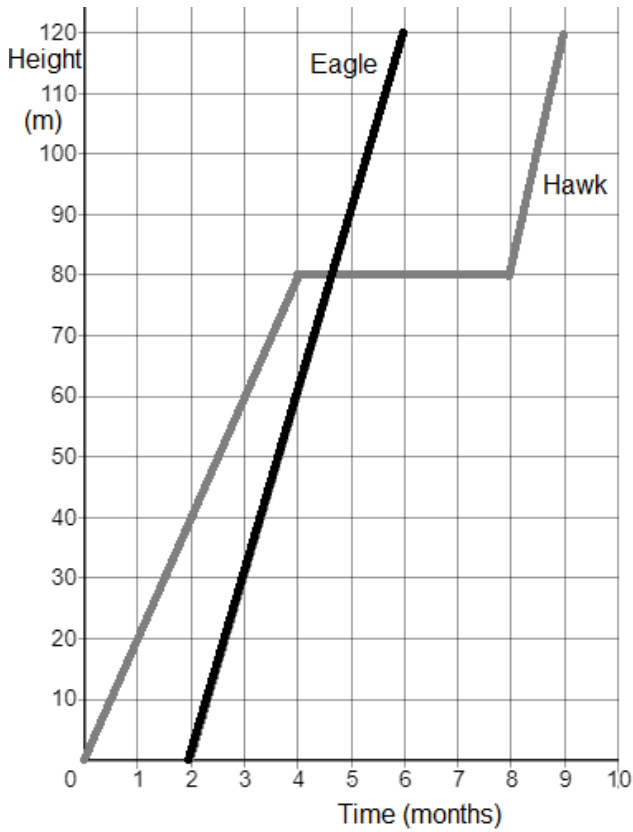
- b) How fast did the tank fill when it rained?

- c) What is the equation of the line when the tank is losing water?

- d) On the graph add lines that show
 i) a tanks that starts with no water, then adds $2 \text{ m}^3/\text{day}$ for two days.
 ii) after three more days starts to **lose** water at $1 \text{ m}^3/\text{day}$.



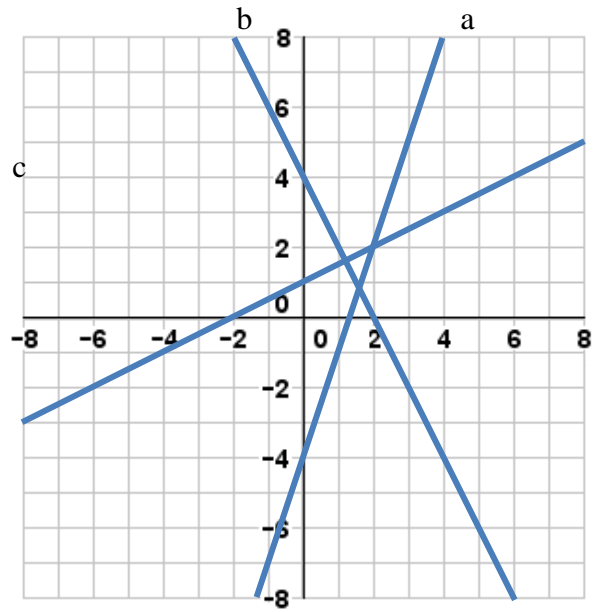
QUESTION FOUR



Eagle and Hawk construction are hired to build identical tower blocks.

- a) Who finished first, and by how long?
- _____
- b) i) What is the time during which the fastest building takes place?
- _____
- ii) How fast is that fastest rate?
- _____
- c) At what time is Eagle's building taller than Hawks? Explain your answer fully.
- _____
- _____
- _____

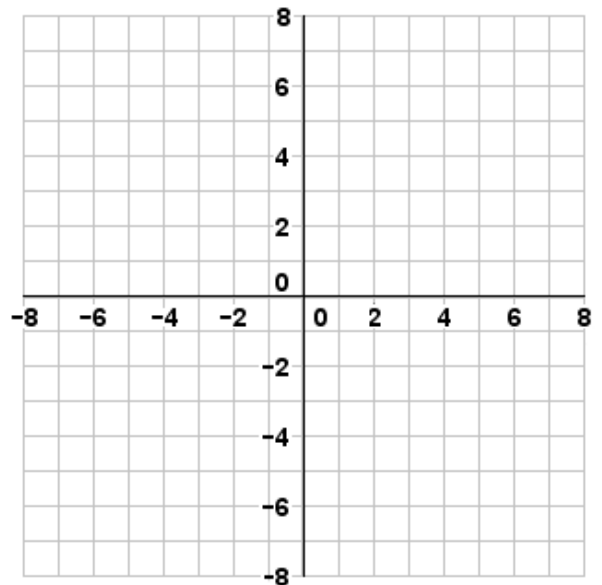
QUESTION FIVE



Write the equations for the lines above:

- a) _____
- b) _____
- c) _____

QUESTION SIX



On the grid above, draw in the lines

- a) $x = 5$
- b) $y = 4x + 4$
- c) $y = -0.5x + 3$



Measurement

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Formulas

Area of Triangle = $\frac{1}{2} b h$

Area of Trapezium = $\frac{a + b}{2} h$

Area of Circle = πr^2

Circumference = πd

QUESTION ONE

Complete the following conversions:

- a) 850 m = _____ km
- b) 2.5 L = _____ mL
- c) 720 minutes = _____ hours
- d) 4 $\frac{1}{2}$ days = _____ hours

QUESTION TWO



- a) This truck's weight is 8.5 in what units?

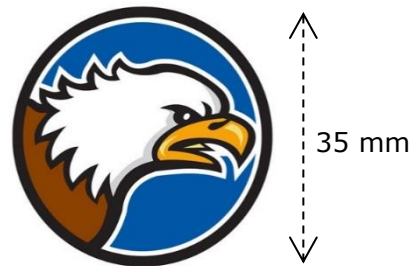


- b) The area of this badge is 9.1 in what units?

Do not forget to put units with all your answers in this section of the paper.

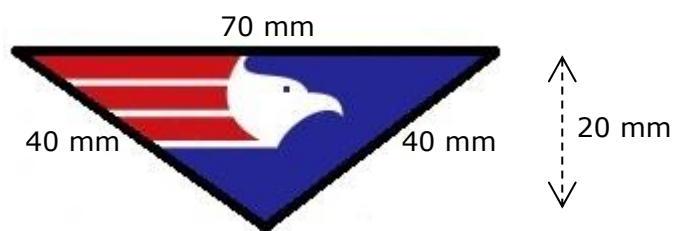
QUESTION THREE

- a) Eagle are making badges for their staff.



What distance would the black stitching around the outside of each badge be?

- b) What is the amount of black stitching around the edge of this badge?



- c) What is the area of the triangular badge?

QUESTION FOUR

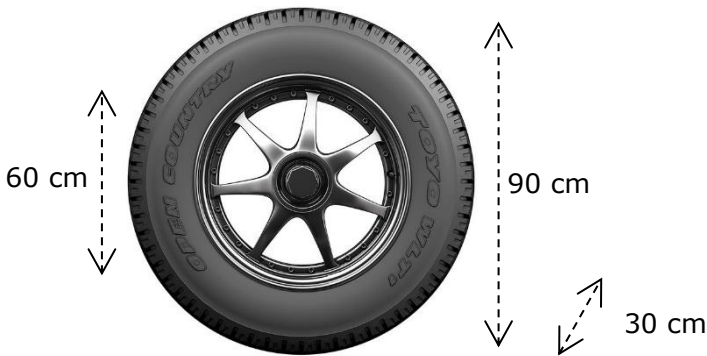
Eagle's trucks leave their Auckland base at 6:45 a.m. every morning.

- a) If it takes the Wellington truck seven hours and fifty minutes, when does it arrive?

- b) The Palmerston North truck arrives at 1:15 p.m. Write that in 24 hour time.

- c) The Tauranga truck arrives at 9:05 a.m., how many minutes does the trip take?

QUESTION FIVE



A light truck tyre is shown.
 It is 60 cm inner diameter across the rim.
 The outer diameter is 90 cm, but the rubber is 2 cm thick around the outside.
 It is 30 cm across, but the rubber is 1 cm thick on the sides
 If a pump fills at 500 cm³ per second, how many seconds will it take to fill this tyre?

QUESTION SIX

- a)



Eagle do some bulk transport with large cuboid trailers, as shown behind this truck.
 If these trailers are 12 metres long, 4.8 metres tall and 4.4 metres wide, what is their volume?

- b)



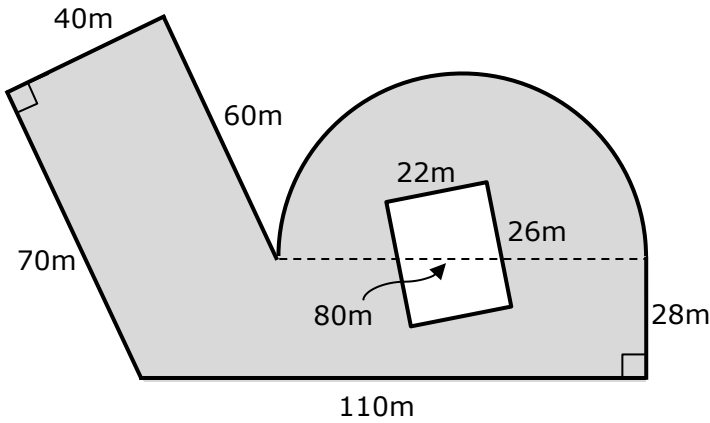
Eagle have cylindrical trailers to carry petrol and similar.
 The cylinders are 12.2 metres long and have a diameter of 3.8 metres.
 What is their volume, in **litres**?

QUESTION SEVEN

Eagle transport want to repave one of their bases. It is an irregular shape with a rectangular warehouse in the middle.

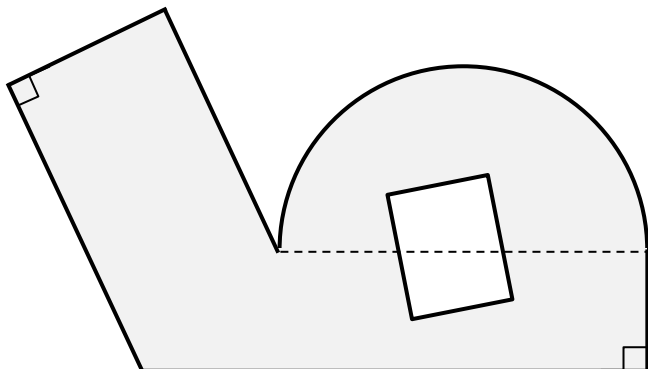
The shape and dimensions are shown below, where the grey is the parts they are going to repave.

Calculate the area involved.



The dotted distance is 80m
 The rectangular building is 22m by 26m
 All measurements are the straight line portions.

Another plan is provided for your working out.



Trigonometry

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QUESTION ONE

Evaluate the expressions:

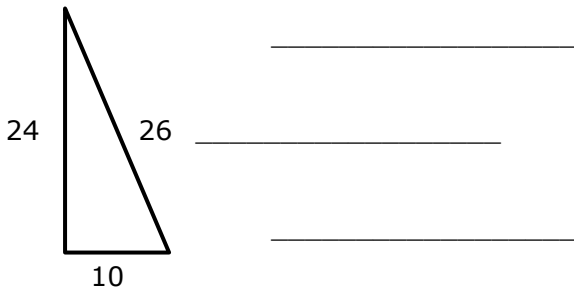
a) $\cos(50^\circ) =$ _____

b) $\tan^{-1}(0.88) =$ _____

c) $\frac{9}{\sin 50^\circ} =$ _____

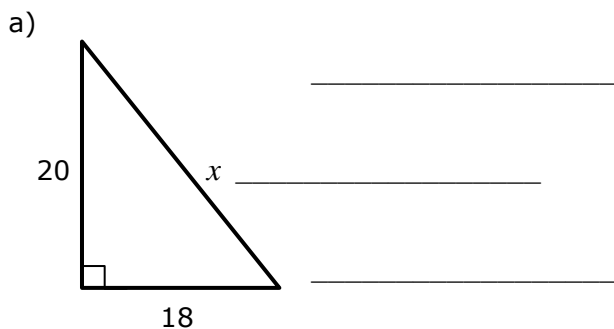
QUESTION TWO

Use Pythagoras' Theorem to show if this is a right angled triangle.

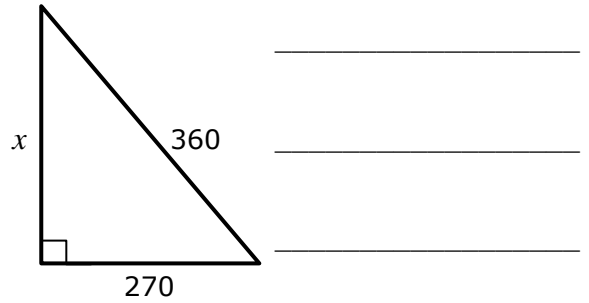


QUESTION THREE

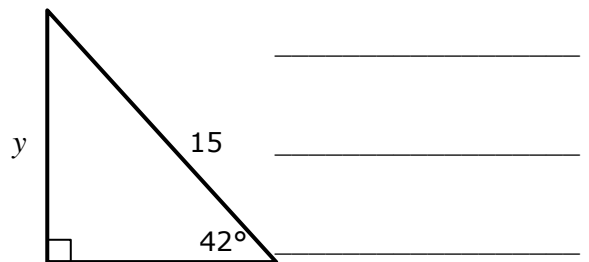
Calculate the unknown side length for each of these triangles:



b)

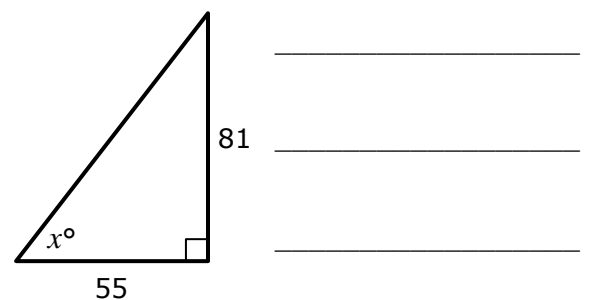


c)



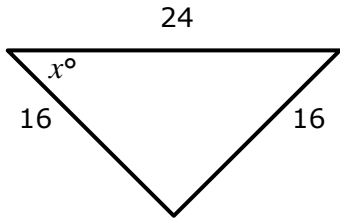
QUESTION FOUR

Calculate the unknown angle:



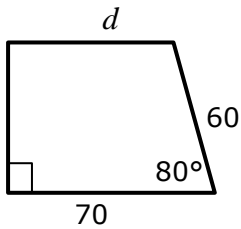
QUESTION FIVE

Calculate the unknown angle:



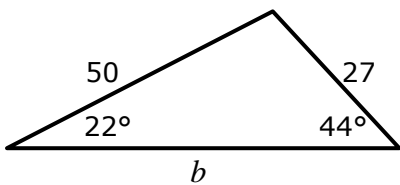
QUESTION SIX

Calculate the side length of this trapezium, d .



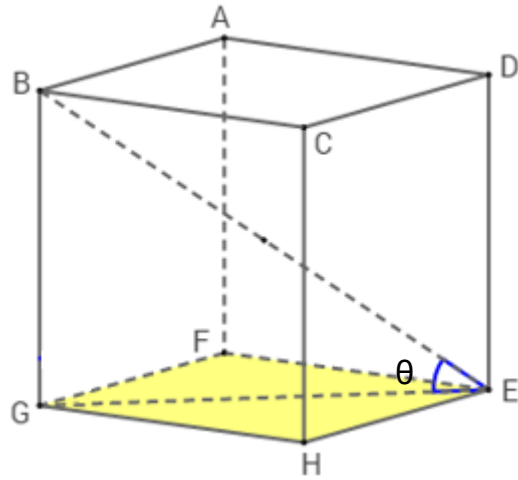
QUESTION SEVEN

Calculate the base length of the triangle, b .



QUESTION EIGHT

This is a cube, 10 cm along each edge.
Calculate $\angle BEG$, the angle θ .



QUESTION NINE

Calculate the distance d shown dashed.
The pentagon has mirror symmetry.

