Edexcel Paper 1H Practice Booklet

20 practice questions based on the advance information

Copies of this booklet, as well as hints & solutions, are available at bossmaths.com/advanceinfo

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Question 1

Which is greater, $\frac{4}{3}$ of 87 g or 14% of 800 g?

$\frac{1}{3}$ of 87 = 29 → (×4) → $\frac{4}{3}$ of 87 = 116 (×4)

1% of 800 = $\frac{1}{100}$ of 800 = 8 → (×14) → 14% of 800 = 112 (×14)

So $\frac{4}{3}$ of 87 g is greater

Question 2

Write 3.8×10^7 as a product of prime factors.

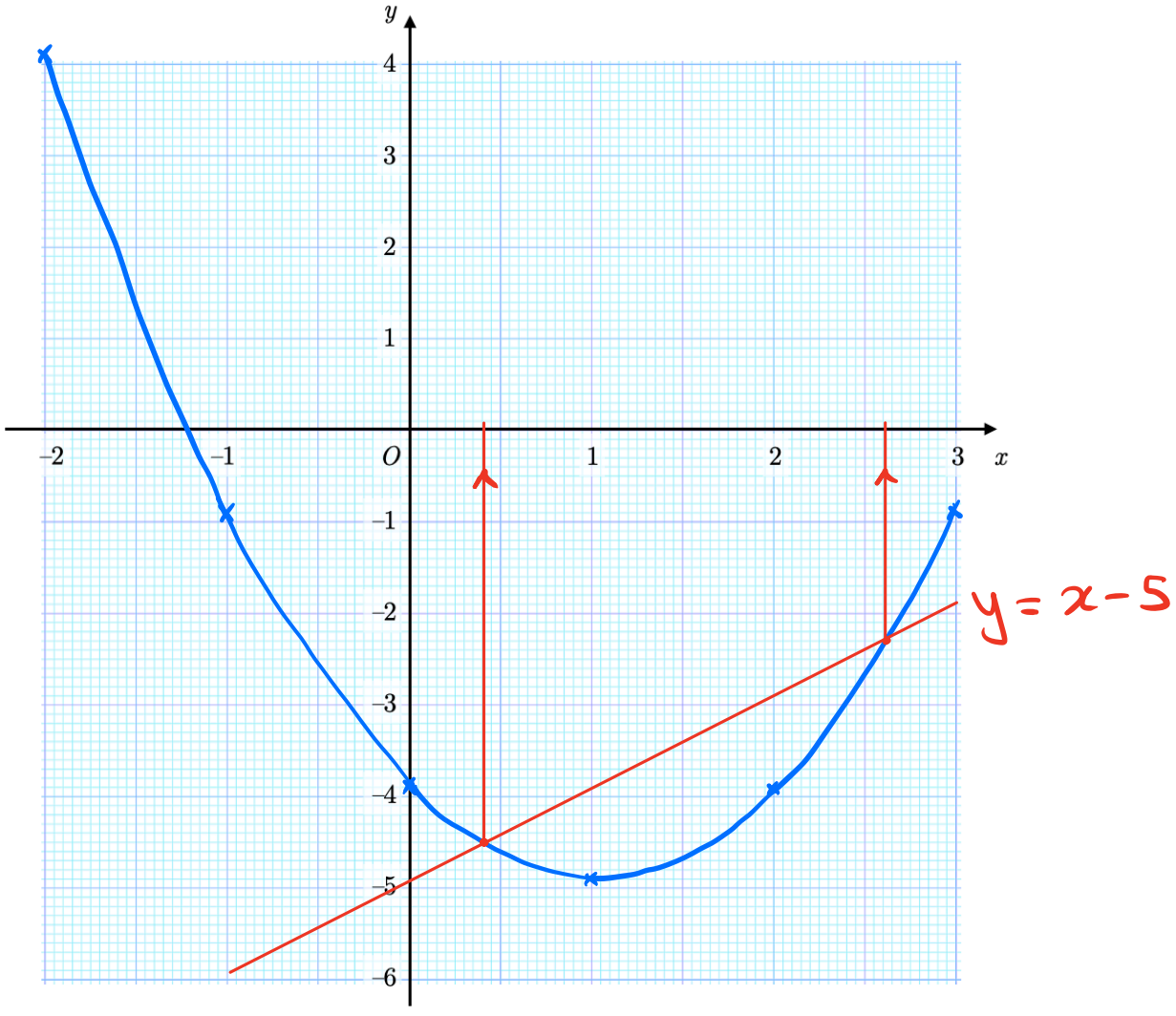
$$3.8 \times 10^7 = 3.8 \times 10 \times 10^6$$
$$= 38 \times 10^6$$
$$= 2 \times 19 \times (2 \times 5)^6$$
$$= 2 \times 19 \times 2^6 \times 5^6$$
$$= 2^7 \times 5^6 \times 19$$

Question 3

(a) Complete the table of values for $y = x^2 - 2x - 4$

x	–2	–1	0	1	2	3
y	4	-1	-4	-5	-4	-1

(b) On the grid, draw the graph of $y = x^2 - 2x - 4$ for values of x from –2 to 3.



(c) By drawing a suitable straight line, use your graph to find estimates for the solutions of $x^2 - 3x + 1 = 0$

$x^2 - 3x + 1 = 0$

$+x \quad -5 \qquad +x \quad -5$

$\Rightarrow \quad x^2 - 2x - 4 = x - 5$

Estimated solutions: $x = 0.4$, $x = 2.6$

Question 4

Simplify each of these expressions as far as possible.

(a) $5\sqrt{44} - 8\sqrt{11}$

$= 5\sqrt{4}\sqrt{11} - 8\sqrt{11}$

$= 5 \times 2\sqrt{11} - 8\sqrt{11} = 10\sqrt{11} - 8\sqrt{11} = \underline{2\sqrt{11}}$

(b) $\sqrt{34} \times \sqrt{17}$

$= \sqrt{2} \times \sqrt{17} \times \sqrt{17} = \sqrt{2} \times (\sqrt{17} \times \sqrt{17})$

$= \sqrt{2} \times 17 = \underline{17\sqrt{2}}$

(c) $-7x - 3(9 - 2x)$

$\equiv -7x + -3(9 - 2x)$

$\equiv -7x - 27 + 6x$

$\equiv \underline{-x - 27}$

Many students go wrong here!

Question 5

Expand and simplify $(x - 3)(x + 10)(x + 3)$

$(x-3)(x+10)(x+3)$

$\equiv (x^2 + 7x - 30)(x+3)$

$\equiv x^3 + 3x^2 + 7x^2 + 21x - 30x - 90$

$\equiv \underline{x^3 + 10x^2 - 9x - 90}$

In this case, spotting that we have a difference of two squares could save a bit of time:

$(x-3)(x+3)(x+10)$

$\equiv (x^2 - 9)(x + 10)$

$\equiv \underline{x^3 + 10x^2 - 9x - 90}$

Question 6

Work out $\left(8 \times 10^{15}\right)^{-\frac{2}{3}}$, writing your answer in standard form.

$$\left(8 \times 10^{15}\right)^{-\frac{2}{3}} = \left(\left(\left(8 \times 10^{15}\right)^{\frac{1}{3}}\right)^{2}\right)^{-1} = \left(\left(2 \times 10^{5}\right)^{2}\right)^{-1}$$

$$= \left(4 \times 10^{10}\right)^{-1} = 4^{-1} \times 10^{-10}$$

$$= 0.25 \times 10^{-10} = \underline{2.5 \times 10^{-11}}$$

Question 7

A cuboid has length x cm, width y cm, and height 9 cm.

You are given that $3x + 8 \leq 29$ and that $18 - 3y \geq 12$.

Calculate the upper bound for the surface area of the cuboid.

$3x + 8 \leq 29$

$\Rightarrow 3x \leq 21$

$\Rightarrow x \leq 7$

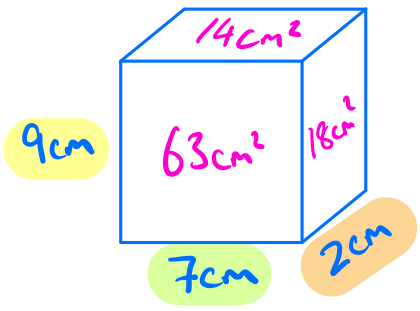
$18 - 3y \geqslant 12$

$\Rightarrow 6 - 3y \geqslant 0$

$\Rightarrow 6 \geqslant 3y$

$\Rightarrow 2 \geqslant y$

Using the upper bounds for x and y:

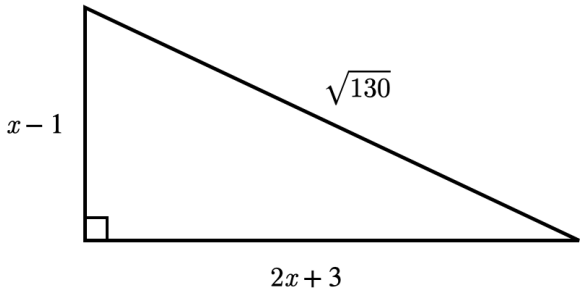


Surface area $= 2(63 + 18 + 14)$

$= \underline{190 \text{ cm}^2}$

Question 8

The diagram shows the lengths, in centimetres, of the sides of a right-angled triangle.
Find the value of x.



Pythagoras' theorem $\Rightarrow (2x+3)^2 + (x-1)^2 = (\sqrt{130})^2$

$\Rightarrow 4x^2 + 12x + 9 + x^2 - 2x + 1 = 130$

$\Rightarrow 5x^2 + 10x + 10 = 130$

$\Rightarrow 5x^2 + 10x - 120 = 0$

$\Rightarrow x^2 + 2x - 24 = 0$

$\Rightarrow (x+6)(x-4) = 0$

This has two solutions: $x = -6$, $x = 4$

If $x = -6$, then $x-1$ and $2x+3$ are negative, which doesn't make sense in this context.

So $x = 4$

Question 9

The interior angles of a triangle are p^o, q^o, and r^o.
You are given that $p = q - 12$ and $r = 2p + 20$. ← This information is unnecessary.
Find the mean of p, q, and r.

P, q, and r must add up to 180.

So the mean is $\frac{180}{3} = 60$.

Question 10

(a) Write $0.1\dot{0}\dot{3}$ as fraction in its simplest form.

Let $x = 0.1030303...$
Then $100x = 10.3030303...$
Subtract $x = 0.1030303...$
to get $99x = 10.2$

So $x = \frac{10.2}{99} = \frac{102}{990}$

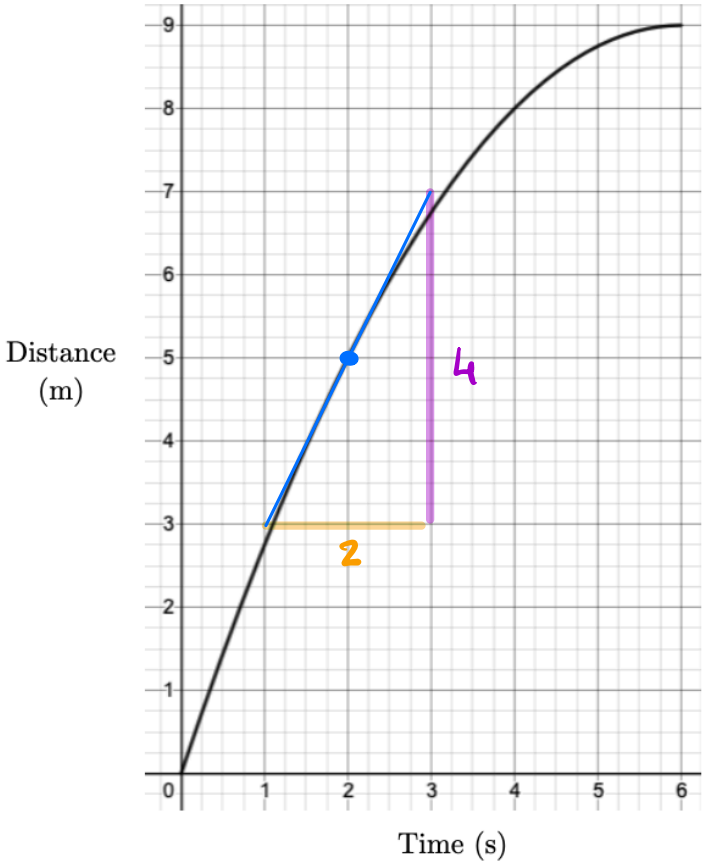
$= \frac{34}{330} = \boxed{\frac{17}{165}}$

(b) A bag contains 330 sweets. The probability of picking an orange sweet from this bag is $0.1\dot{0}\dot{3}$.
How many orange sweets are in the bag?

We would expect the coin to come up heads $\frac{17}{165}$ or $\frac{34}{330}$ of the time. $\frac{34}{330}$ of 330 is 34.

Question 11

The graph shows the distance covered by a cyclist for 6 seconds.

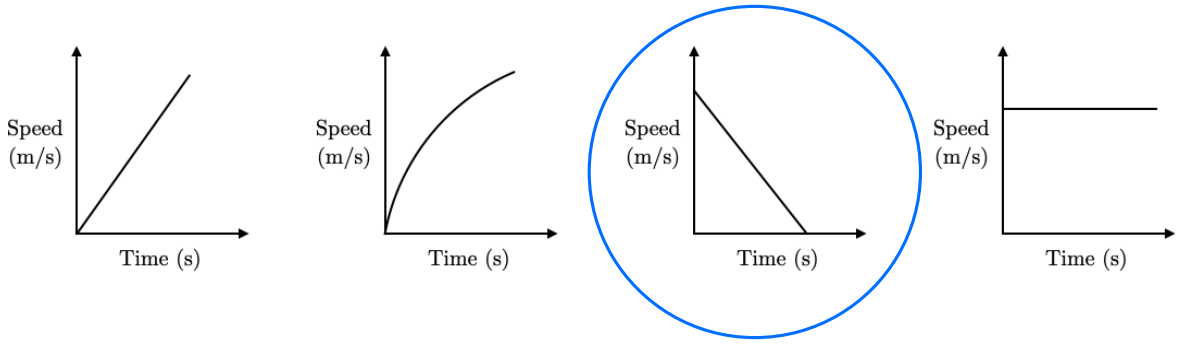


(a) Estimate the speed of the cyclist at the moment she had travelled 5 metres.

↳ gradient of a distance-time curve

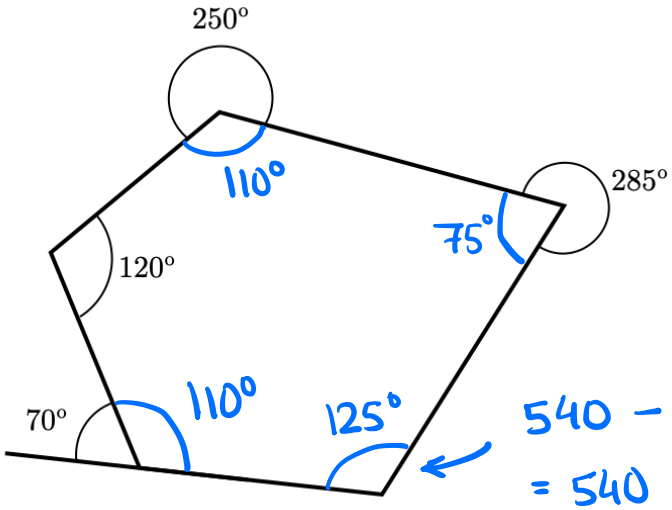
$\frac{4}{2} = 2\text{m/s}$

(b) Here are four sketches of speed-time graphs. Circle the sketch that represents the cyclist's speed during the six-second period shown above.



Question 12

The diagram shows pentagon. Various angles are marked on the diagram.
Show that the ratio of the pentagon's largest interior angle to its smallest interior angle is 5 : 3



Interior angles add up to $5 \times 180° - 360°$

$= 540°$

$540 - (110 + 120 + 110 + 75)$

$= 540 - 415 = 125°$

Largest = 125°
Smallest = 75°

Ratio = 125 : 75 = 5 : 3

Question 13

There are two biscuit tins. Each tin contains a mix of chocolate biscuits and plain biscuits.
The ratio of chocolate biscuits to plain biscuits in the first tin is 3 : 7
The ratio of chocolate biscuits to plain biscuits in the second tin is 4 : 1.

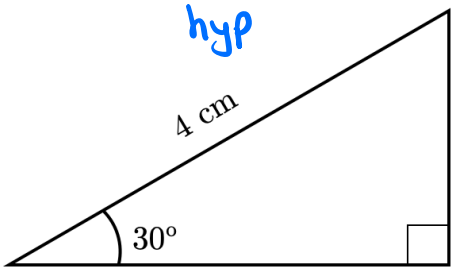
Enda picks at random one biscuit from each tin.

Work out the probability that Enda picks two chocolate biscuits.

$\frac{3}{10} \times \frac{4}{5} = \frac{12}{50} = \frac{6}{25}$ or 0·24 or 24%

Question 14

This triangle has area $\sqrt{k}$ cm^2. Find the value of k.



hyp

opp = 2 cm

adj = $2\sqrt{3}$ cm

$\sin(30) = \frac{\text{opp}}{\text{hyp}}$

$\Rightarrow \frac{1}{2} = \frac{\text{opp}}{4}$

$\Rightarrow$ opp = 2 cm

$\cos(30) = \frac{\text{adj}}{\text{hyp}}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{\text{adj}}{4}$

$\Rightarrow$ adj = $2\sqrt{3}$ cm

Area = $\frac{1}{2}$ × base × height

= $\frac{1}{2} \times 2\sqrt{3} \times 2$

= $2\sqrt{3}$ cm^2 = $\sqrt{12}$ cm^2

so $k = 12$

Question 15

An aluminium alloy has a density of 3 g/cm^3.
A cube of mass 375 g is made of this aluminium alloy.
Work out the side length of the cube.

$\text{Density} = \frac{\text{mass}}{\text{volume}}$

$3\text{g/cm}^3 = \frac{375\text{g}}{\text{volume}}$

$\Rightarrow \text{volume} = \frac{375\text{g}}{3\text{g/cm}^3}$

$= 125\text{ cm}^3$

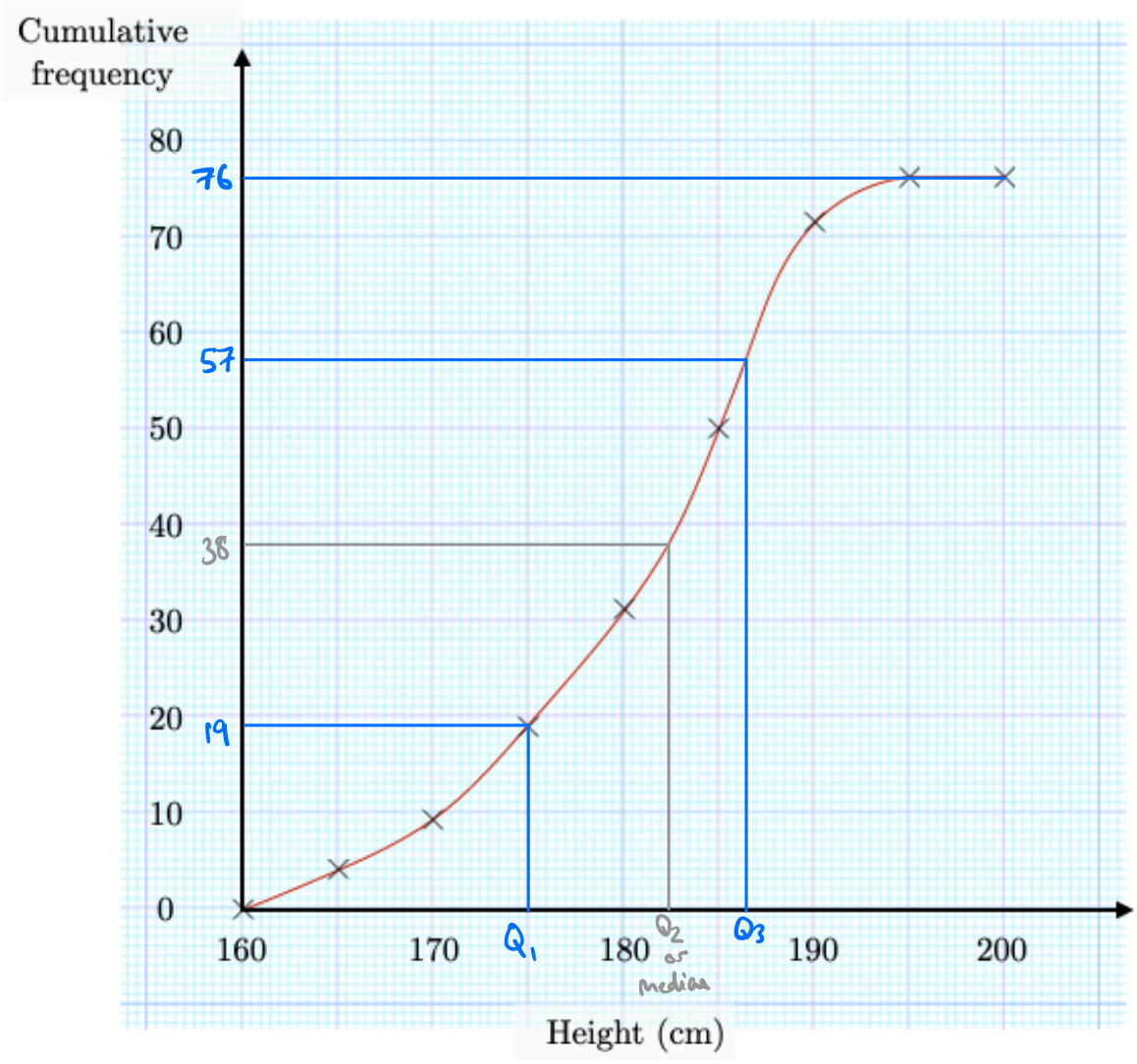
Side length in cm

$= \sqrt[3]{125}$

i.e. side length = 5cm

Question 16

This cumulative frequency graph shows information about the heights, in cm, of rowers at a rowing club.



Work out an estimate for the interquartile range of heights of the rowers.

Estimated IQR = $Q_3 - Q_1$

= 186.5 − 175

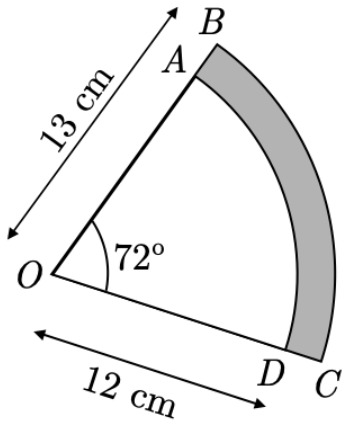
= 11.5 cm or something close — examiners usually allow some leeway.

Question 17

OAD and OBC are sectors of circles with centre O.

The points O, A, and B lie on a straight line. Similarly, the points O, D, and C lie on a straight line.

OB has length 13 cm and OD has length 12 cm.



Find, in terms of π, the shaded area $ABCD$ in cm^2.

Area of sector OBC $= \frac{72}{360} \times \pi \times 13^2 = \frac{169}{5}\pi$

Area of sector OAD $= \frac{72}{360} \times \pi \times 12^2 = \frac{144}{5}\pi$

Shaded area ABCD $= \frac{169}{5}\pi - \frac{144}{5}\pi$

$= \frac{25}{5}\pi = 5\pi$

Question 18

(a) $\dfrac{x+2}{x-1} - \dfrac{x+3}{x+1}$ can be written in the form $\dfrac{x+a}{x^2+b}$, where a and b are integers.

Work out the values of a and b.

$$\frac{(x+2)(x+1)}{(x-1)(x+1)} - \frac{(x-1)(x+3)}{(x-1)(x+1)}$$

$$= \frac{(x^2+3x+2)}{(x-1)(x+1)} - \frac{(x^2+2x-3)}{(x-1)(x+1)}$$

$$= \frac{x+5}{x^2-1} \quad \text{so} \quad a = 5, \; b = -1$$

(b) Hence, or otherwise, work out $\dfrac{1002}{999} - \dfrac{1003}{1001}$

Substitute $x = 1000$ above to get

$$\frac{1002}{999} - \frac{1003}{1001} = \frac{1000+5}{1000^2-1} = \frac{1005}{999{,}999}$$

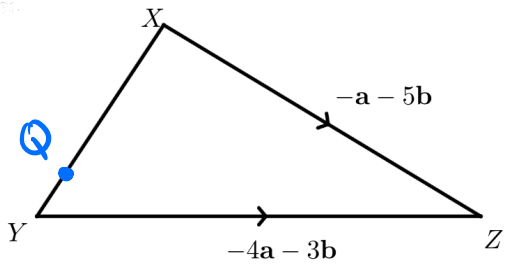
Question 19

The diagram shows the points, X, Y, and Z.

The vector $\overrightarrow{XZ} = -\mathbf{a} - 5\mathbf{b}$
The vector $\overrightarrow{YZ} = -4\mathbf{a} - 3\mathbf{b}$

Q is the point on XY such that $XQ : QY = 5 : 1$

Find the vector $\overrightarrow{ZQ}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.



$\overrightarrow{XY} = \overrightarrow{XZ} + \overrightarrow{ZY}$

$= -\underline{a} - 5\underline{b} + 4\underline{a} + 3\underline{b}$

$= 3\underline{a} - 2\underline{b}$

$\overrightarrow{ZY} = -\overrightarrow{YZ}$

$\overrightarrow{ZQ} = \overrightarrow{ZX} + \overrightarrow{XQ}$

$= \overrightarrow{ZX} + \frac{5}{6}\overrightarrow{XY}$

$= \underline{a} + 5\underline{b} + \frac{5}{6}(3\underline{a} - 2\underline{b})$

$= \underline{a} + 5\underline{b} + \frac{5}{2}\underline{a} - \frac{5}{3}\underline{b}$

$= \frac{2}{2}\underline{a} + \frac{15}{3}\underline{b} + \frac{5}{2}\underline{a} - \frac{5}{3}\underline{b}$

$= \frac{7}{2}\underline{a} + \frac{10}{3}\underline{b}$

$\overrightarrow{ZX} = -\overrightarrow{XZ}$

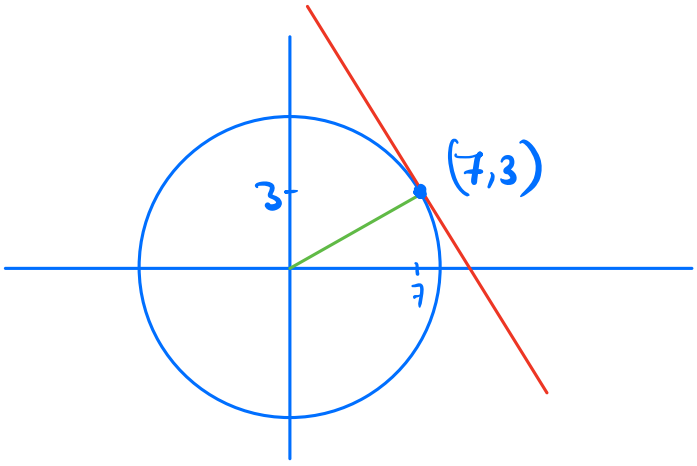
$\overrightarrow{XQ} = \frac{5}{6}\overrightarrow{XY}$

Question 20

(a) The point A has coordinates (7, 3). Given that A lies on the circle with equation $x^2 + y^2 = k$, find the value of k.

$7^2 + 3^2 = k$

$\Rightarrow 49 + 9 = k \quad \Rightarrow k = 58$



(b) Find the equation of the tangent to the circle at A, giving your answer in the form $y = mx + c$

The tangent is perpendicular to the radius at (7,3)

The radius has gradient $\frac{3}{7}$

$\therefore$ the tangent has gradient $-\frac{7}{3}$

$y - 3 = -\frac{7}{3}(x - 7) = -\frac{7}{3}x + \frac{49}{3}$

$\Rightarrow y - \frac{9}{3} = -\frac{7}{3}x + \frac{49}{3} \Rightarrow y = -\frac{7}{3}x + \frac{58}{3}$