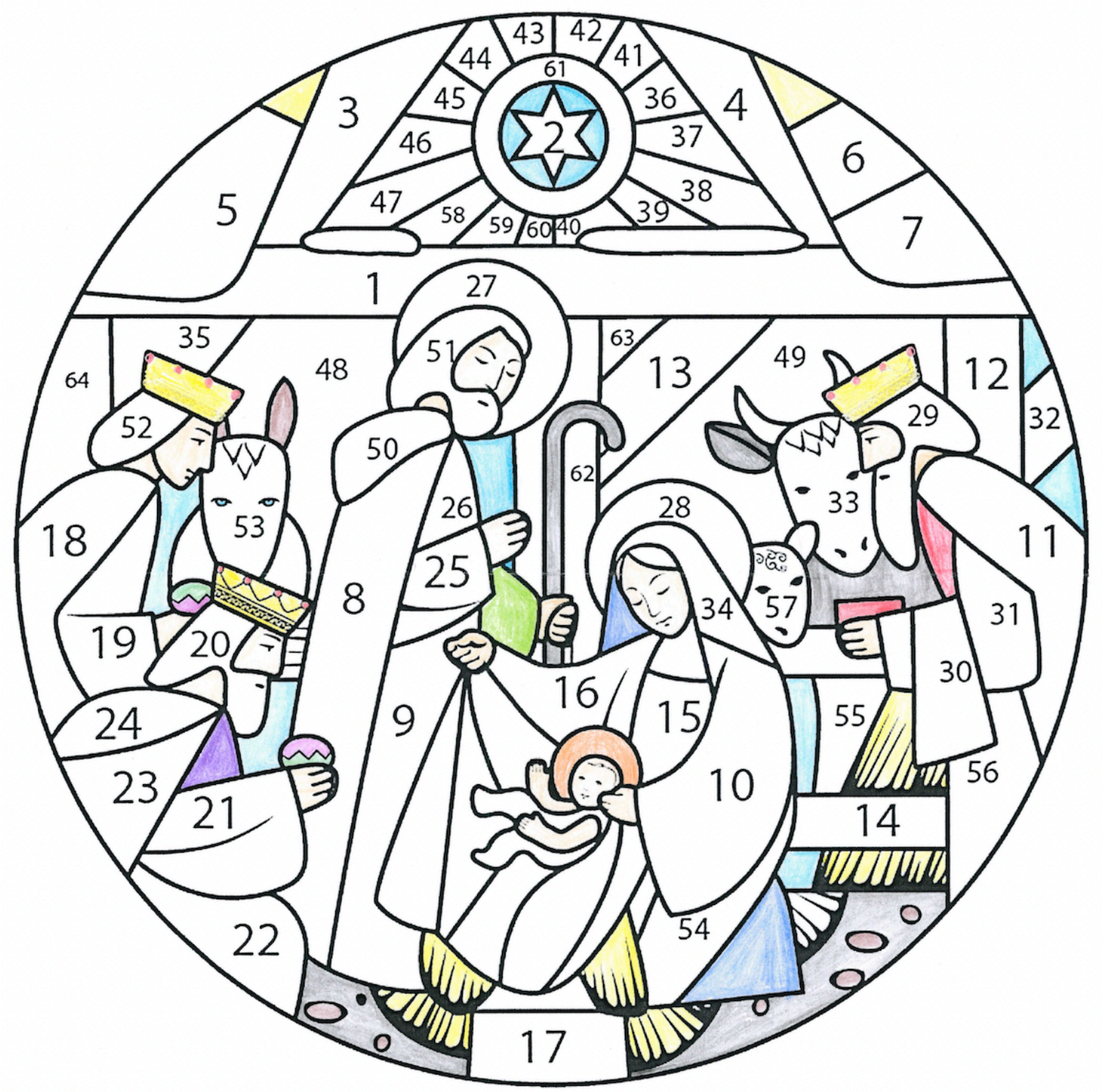
A-Level Christmas Calculated Colouring 2022

Number	**2**	**10**	**5**	**3**	**36**
Colour	Brown	Light Blue	Dark Blue	Yellow	Orange
Number	**4**	**7**	**8**	**11**	**12**
Colour	Red	Purple	Green	Grey	Black



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1 The only positive root of the polynomial $p(x) = x^3 + 2x^2 - 5x - 6$.

2 The $x-$coordinate of the solution to the simultaneous equations $2x + 4y = 22$ and $5x + 3y = 27$

3 The $x-$coordinate of the centre of the circle $x^2 - 4x + y^2 - 6y - 12 = 0$

4 Find a such that the coefficient of x^3 in the expansion of $(x + a)^4$ is 8.

5 The $y-$intercept of the quadratic $y = (x + 1)^2 + 2$.

6 One third of the discriminant of the quadratic function $2x^2 + 5x + 2$.

7 The absolute value of the gradient of the line passing through $(-8,6)$ and $(-5, -3)$.

8 The denominator when you rationalise $\dfrac{3}{\sqrt{10} - \sqrt{12}}$.

9 One half of the fourth square number.

10 The radius of the circle $x^2 - 4x + y^2 - 6y - 12 = 0$.

11 $\dfrac{x^2 + 5x - 14}{x^2 + 2x - 8}$ can be written in the form $\dfrac{x + a}{x + b}$. Find the value of a.

12 Find $\sqrt{8}$ in the form $a\sqrt{2}$. The answer is a.

13 The $x-$coordinate of the turning point of the quadratic $y = x^2 - 4x - 6$.

14 The number of intersections between the line $y = 2x + 1$ and $y = 2x^2 + 2x - 5$.

15 The positive $x-$coordinate of the intersection of the circle $(x - 2)^2 + (y - 3)^2 = 25$ and the line $-4x + 3y = 1$.

16 The denominator when you rationalise $\dfrac{3}{\sqrt{5}}$.

17 The repeated root of the polynomial $p(x) = x^3 - 3x^2 + 4$.

18 The power of 3 in the prime factorisation of 43740.

19 The number of solutions to $\tan(4x) = \dfrac{1}{2}$ in the interval $0^\circ \leq x \leq 360^\circ$.

20 The radius of the circle $x^2 - 2x + y^2 + 6y - 134 = 0$.

21 Find b such that $\sqrt{252} = a\sqrt{b}$.

22 The $x-$coordinate of the turning point of the quadratic $y = x^2 - 14x + 61$.

23 The $y-$intercept of the line parallel to $y = 2x - 4$ passing through $(-2,3)$.

24 The absolute value of the $y-$coordinate of the intersection of the lines $4x - 5y = 7$ and $-2x + y = 7$.

25 A triangle has side lengths $\dfrac{4}{\sqrt{3}}$ and 8 with the angle subtended between them being $60°$. Find the area.

26 Find a such that $(x + a)$ is the only linear factor of the polynomial $p(x) = x^3 + 11x^2 + 25x + 8$

27 $46656^{\frac{1}{3}}$

28 The area of the triangle with vertices the origin and the intersections of the line $y = -\dfrac{x}{2} + 6$ and the axes.

29 The sum of the roots of $p(x) = x^3 - 12x^2 + 47x - 60$.

30 The $y-$coordinate of the solution to the simultaneous equations $2x + 4y = 22$ and $5x + 3y = 27$.

31 The number of solutions to $\sin(x) = \dfrac{1}{2}$ in the interval $0° \leq x \leq 540°$.

32 Find a such that when you rationalise the denominator of $\dfrac{3}{a + \sqrt{5}}$ you obtain $3\sqrt{5} - 6$.

33 Given that $(x - 2)$ and $(x + 1)$ are factors of $p(x) = x^4 + 3x^3 + ax^2 - 3x + b$, find the absolute value of a.

34 The length of the line segment between $(-1,6)$ and $(3,3)$.

35 The $x-$coordinate of the intersection point of the lines $y = x - 3$ and $y = -3x + 5$.

36 Find c such that $(x + 1)(x - 6)^2 = x^3 - 11x^2 + 24x + c$

37 The gradient of $y = x^2 + x + 5$ when evaluated at a has value 7. Find a.

38 The square of the radius of the circle where $A(-2,3)$ and $B(-2, -9)$ are

endpoints of a diameter.

39 Find b such that $(2x+1)(x-b)^2 = 2x^3 - 11x^2 + 12x + 9$.

40 The coefficient of x^2 in the expansion of $(2+x)^n$ is 24. Find n.

41 Find a such that $\sqrt{63} = a\sqrt{b}$.

42 Double the he coefficient of x^5 in the expansion of $(x+3)^6$

43 The radius of the circle $(x+1)^2 + y^2 = 9$.

44 The value of $\binom{7}{2} + 3\binom{5}{1}$, where $\binom{a}{b}$ means "a choose b"

45 The power of x when you simplify $\dfrac{x^3y^2z}{2x} \times \dfrac{x^4y}{3x^3z^2}$

46 The coefficient of x^2 term appearing in the derivative of $y = x^4 + 12x^3 + 3x^2$

47 The gradient of the line perpendicular to $y = -\dfrac{1}{3}x + 2$.

48 The $y-$intercept of the line passing through $(-4,2)$ and $(-1,8)$.

49 The absolute value of the $y-$coordinate of the turning point of the quadratic $y = x^2 - 4x - 6$.

50 The discriminant of the quadratic $y = x^2 + 6x + 7$.

51 $14641^{\frac{1}{4}}$.

52 The $x-$coordinate of the intersection point the quadratic $y = x^2 - 2x - 5$ and the line $y = 4x - 14$

53 The $x-$intercept of the line $y = 4x - 8$.

54 The gradient of the line passing through $(1,0)$ and $(3,10)$.

55 Given that $(x-2)$ and $(x+1)$ are factors of $p(x) = x^4 + 3x^3 + ax^2 - 3x + b$, find b.

56 A right angled triangle has two sides which are of length 3 and 5. Given that all sides are integer length what is the length of the other side.

57 One ninth of the $y-$intercept of the tangent to $y = x^3 - 14x^2 - 16x + 96$ when $x = 1$

58 $a^2 = 12 \times 108$. Find a.

59 $\dfrac{x^2 + 5x - 14}{x^2 + 2x - 8}$ can be written in the form $\dfrac{x+a}{x+b}$. Find the value of b.

60 Absolute value of the repeated solution of $x^2 + 8x + 16 = 0$.

61 The $x-$coordinate of the point where the circles with equations

$x^2 + y^2 = 16$ and $x^2 - 18x + y^2 + 56 = 0$ touch.

62 The number of factors of a prime number.

63 The real valued solution to $2^x = 4^5$.

64 The remainder on dividing $x^3 + 4x^2 + 5x + 12$ by $(x + 2)$.